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UNIVERSITY OF ALBERTA

DEVELOPMENT AND EVALUATION OF A CAI PROGRAM ON CONTRACEPTION

BY

LUC THERRIEN ©

THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES AND
RESEARCH IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR
THE DEGREE OF MASTER OF NURSING

FACULTY OF NURSING

EDMONTON, ALBERTA

FALL 1992

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The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research for acceptance, a thesis entitled DEVELOPMENT AND EVALUATION OF A CAI PROGRAM ON CONTRACEPTION submitted by LUC THERRIEN in partial fulfillment of the requirements for the degree of MASTER OF NURSING.

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Date: 1 September 1992

ABSTRACT

The purpose of this study was to develop and evaluate a computer-assisted instruction (CAI) program to teach a lesson on contraception to grade nine students. Principles of instructional design guided the development of the CAI program and an evaluation tool, in the form of a quiz, to measure this knowledge.

Both the CAI program and the quiz were validated by five experts: four sexuality educators in the school system and one community health nurse who has specialized knowledge in human sexuality. A pilot study was conducted to assess and improve the quality of each item of the quiz as well as to determine how much gain in knowledge was a function of retesting alone.

The design for this study was quasi-experimental and used the non equivalent control group procedure with pre-test and post-test measures of the dependent variable. The two independent variables were the CAI program for the treatment group and the lecture for the control group. The dependent variable was contraception knowledge as measured by the quiz.

A total of 157 students completed the pre-test, the instruction and the post-test. Entire classes were assigned to one of the two groups with the students representing the unit of analysis.

Both the CAI program and the lecture significantly increased the contraception knowledge level of grade nine students. There was no difference in knowledge gain, however, between the two methods of instruction. The CAI program was found to be as effective as the conventional lecture format in teaching about contraception.

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CHAPTER 1: INTRODUCTION

Educating, counseling and providing guidance regarding adolescent contraception are important activities of community health and school nurses because unwanted pregnancies in teenage women have a number of ramifications: potential for health deterioration; thwarted educational opportunities; and socioeconomic limitations often leading to an adult life of poverty. Accurate contraceptive knowledge should lead to responsible contraceptive behavior resulting in the promotion of healthy sexuality and prevent unwanted pregnancies.

To further stress the importance of the need for contraceptive use in adolescents, it is estimated that 79 adolescents between the ages of 10 and 14 were pregnant in Alberta in 1990 representing an estimated pregnancy rate of 0.9 per 1000 females in the stated age range. In the 15 to 19 age group, the estimated pregnancies reached 4576 in 1990 representing an estimated pregnancy rate of 51.9 per 1000 females (Alberta Health, 1991).

Parents are considered primarily responsible for sexuality education, but it has been found that they often do not provide adequate information to their children (Krupa, 1990; Meikle, Peitchinis, & Pearce, 1985). Although junior high and high school programs can provide factual information regarding sexuality and contraception to adolescents, the quality of information a student receives is dependent on the school's philosophy and the degree to which the teacher is comfortable in relaying such information. In the Edmonton area, some students commented on the rapid manner in which the content was covered in class as well as on their teacher's embarrassment when sexuality issues were discussed

(Jimenez, July 21, 1991). In one high school outside of Edmonton, some teachers ended up spending as little as one class period of 40 minutes over the year teaching human sexuality (K. Wendel, personal communication, October 18, 1991) compared to nine hours recommended in the Health and Personal Life Skills Curriculum Guide (Alberta Education, 1986). Thus, it would seem that not all Alberta students receive the same amount and quality of information.

Sexuality educators from the two schools approached to participate in this study responded positively to the idea of developing and implementing a computer-assisted instruction (CAI) program to teach contraception to grade nine students. One educator commented that a CAI program would ensure that all students received the same quantity and quality of information (K. Wendel, personal communication, October 18, 1991).

Although the main responsibility for sexuality education has fallen on the teacher's shoulders, when it comes to contraception, it is noted in the curriculum guide (Alberta Education, 1987, p., 206) that the teacher should invite a representative from a health agency to provide this particular information. Until this year, in one school district, a community health nurse from a local Health Unit who specialized in sexuality education taught the lesson on contraception to the grade eight and grade nine students. Similarly, in another school district, a nurse holds the title of sexuality coordinator and provides consultation to the school teachers. As the health care budget dwindles, nurses will have difficulty maintaining services to schools and one service to be gradually eliminated will be teaching contraception directly to junior high and high school classes (L. MacMillan, personal communication, October 10, 1991). Thus, other means of transmitting information related to sexuality and contraception are being sought.

Finally, although the popular perception is that contraception is mainly the responsibility of women, this perception is slowly changing. Women are starting to go to birth control clinics accompanied by their partners rather than alone. The problem however, is that such clinics are not equipped to include men who often end up sitting in the waiting rooms flipping through magazines. A computer and a selection of CAI programs could be watched by men who remain in the waiting rooms (P. Cuddy, personal communication, May 9, 1991) or even at home prior to the appointment at the birth control clinic. Viewing such programs might decrease embarrassment and subsequently help the couple formulate questions for the nurse.

In summary, community health nurses as well as sexuality educators are seeking new ways of providing information regarding contraception to adolescents to prevent unwanted pregnancies. Computer-assisted instruction is proposed as an alternative method to transmit contraception information to adolescents.

Purposes of the Study

1. To develop a lesson on contraception for grade nine students using a computer-assisted instruction.
2. To compare a CAI program and a lecture in raising the knowledge level of grade nine students about contraception.

Research Question

Is there a difference in knowledge gain about contraception between the students who receive a CAI program and students receiving the traditional instructional method as measured by pre and post-tests?

Research Objectives

1. To develop a CAI program on the contraception lesson based on the Alberta Health and Personal Life Skills Curriculum.

2. To develop and test a valid evaluation tool to measure the knowledge level of grade nine students related to contraception.

3. To assess the effect of the CAI program and the lecture format on contraceptive knowledge of grade nine students and determine if there is a difference in knowledge gain when the lesson on contraception is taught through the lecture format as compared to the CAI program.

Definition of Terms

CAI program

Lesson on contraception via the Macintosh™ computer based on the Alberta "Health and Personal Life Skills" Curriculum.

Contraception Knowledge

Information about the different types of contraceptives, their advantages and disadvantages which the grade nine students can remember (Meeks-Mitchell & Heit, 1989).

Operationally, contraception knowledge is a score determined from the students answers to the questions on the pre and post-test.

Grade nine students

Students enrolled in grade nine in an urban school who have agreed to be in the study and who have received parent/guardian permission.

HyperCard™

HyperCard™ is a software program for the Macintosh™ computer used to develop programs called stacks.

HyperTalk™

HyperTalk™ is a programming language integrated in HyperCard™.

Knowledge gain

The score obtained from subtracting the raw score of the pre-test from the raw score of the post-test.

Sexuality

The total expression of an individual's femaleness or maleness through that person's feelings, beliefs, attitudes, values and behaviors. One's sexuality is influenced by many biological, physiological, psychological, ethical, cultural, and sociological factors (Campbell & Golick, 1988, p. 23).

Sexuality education

The teaching of human sexuality based upon the "Health and Personal Life Skills: Curriculum Guide," the health learning and decision-making models of Alberta Education (1986).

Sexually active

Adolescents who have experienced sexual intercourse on at least one occasion (Voydanoff & Donelly, 1990).

Stack

The product of HyperCard™ is located in a file called a stack. HyperCard™ was used to develop the CAI program, thus the file containing the program is called a stack.

Decision-Making Model

The framework underpinning most sexuality education programs is the decision-making model. The decision-making model of the Alberta Health and Life Skills Curriculum Guide (Alberta Education, 1986) is as follows:

1. identify the problem;
2. assess sources of information about the problem;
3. consider all possible alternatives;
4. make a decision;
5. decide on an action plan and put it into effect;
6. accept responsibility for your decision;
7. implement a plan of action;
8. evaluate your decision;
9. the success should be supported by future behavior consistent with the decision; the failure should determine a new course of action.

The development of the CAI program utilized in this investigation was based on this model.

Limitations

The present study focused on developing a CAI program followed by an evaluation of its effectiveness in increasing contraceptive knowledge of grade nine students. It should be acknowledged that contraceptive knowledge is a necessary but insufficient determinant of effective contraceptive behavior (Brooks-Gunn & Furstenberg, 1989). Nevertheless, it was beyond the scope of the present study to examine the effect of the CAI program on contraceptive attitude and behavior of adolescents. Further studies can be conducted to measure the influence of the CAI program on contraception attitude and behavior of adolescents once the cognitive effectiveness of the CAI program has been demonstrated.

Another limitation of this investigation was the number of contraceptive methods presented. In order to keep the length of the CAI program under forty minutes, four methods of contraception were chosen. Had the CAI program been longer, the attention of the students might not have been sustained. Moreover, the presentation of more than four methods of contraception would have required more than one class period to complete the instruction. The four methods of contraception selected were considered most relevant for the students.

CHAPTER 2: LITERATURE REVIEW

Sexuality is a holistic process (Byer, Shainberg, & Jones, 1988) starting at birth and ending with death (Campbell & Golick, 1988; Clarity Collective, 1983). Sexuality, the expression of an individual's femaleness or maleness through that person's feelings, beliefs, attitudes, values and behaviors, is influenced by many biological, physiological, psychological, ethical, cultural, and sociological factors (Campbell & Golick, 1988). Sexual activities involving direct sexual contact represent only a part of sexuality. Sexual activity fluctuates throughout the life of a person whereas sexuality is part of a person's entire life (Campbell & Golick, 1988).

In adolescence, sexuality is influenced by the self and by the individual's culture. The self includes biological and psychological developments such as puberty and formal operational thinking as well as self-esteem, communication skills, and decision-making skills. Peers, family, school, media, customs, economics, religion, law and science constitute the cultural influences of adolescent sexuality (Clarity Collective, 1983). All these factors are so interrelated that, at times, they may seem fused rather than distinct traits (Campbell & Golick, 1988).

Over the past 20 years, many changes have influenced the lives of adolescents including 1) more autonomy, 2) less negative attitudes toward sex and, 3) more opportunity for sexual activity (Voydanoff & Donelly, 1990). Biologically, the age of sexual maturity has lowered gradually over the past 20 years whereas the age of economic maturity has increased (Bonham et al., 1987, Voydanoff & Donelly, 1990). As a result, sexually mature individuals are asked to wait longer before becoming sexually active. Values and norms however, have changed amongst adolescents. Now, a majority of teenagers think that sexual intercourse is acceptable and normal for their age (Committee on Teenage Sexuality [CTS], 1991).

Sexual and Contraceptive Behaviors of Adolescents

A review of the literature has demonstrated that over half of the adolescents in North America will engage in sexual intercourse at least once by age 19. Table 1 presents the findings of the literature review. Some of the highlights of Table 1 are discussed here. Data from a 1979 national survey in the US (N=1,606) indicated that by age 17, 83% of females and 87% of males had engaged in sexual intercourse at least once (Zelnik & Shah, 1983). More recently, in a survey of 107 male African-American college students, the mean age at first intercourse was found to be 12 years of age (Leonard, 1988). In a 1988 survey (N=1,880), 66% of the never married American males in the 15 to 19 age group stated having engaged in sexual intercourse at least once (Sonenstein, Pleck, & Ku, 1989). In Calgary Alberta, a survey of adolescent sexual behaviors conducted in 1981, revealed that by age 17, 49% of the subjects surveyed had engaged in sexual intercourse at least once (Meikle, Peitchinis, & Pearce, 1985). In 1987, a national survey of Canadian youths (N=38,002) revealed that (n=9,925) 8% of grade 7 students, (n=9,860) 26% of grade 9 students and (n=9,617) 47% of adolescents in grade 11 had engaged in sexual intercourse at least once (King et al., 1988). In September 1988, a survey on sexual lifestyle conducted by Gallup revealed that 70% of Canadians in the 18 to 24 age group had their first sexual intercourse before they were 18 years old (cited in King et al., 1988). Thus, there is evidence that many individuals become sexually active before the end of adolescence.

Table 1: Sexual Intercourse and Contraceptive Behavior of Adolescents

Author	Findings
Zelnik, & Shah (1983). (US)	•By age 17, 83% of females had sexual intercourse once. •By age 17, 87% of males had sexual intercourse once. •49% of females used contraception at first intercourse. •44% of males used contraception at first intercourse.
Meikle, Peitchinis, & Pearce (1985). (Canada)	•By age 17, 49% had sexual intercourse once. •54% used contraception at first intercourse. •33% used contraception consistently.
King, Beazley, Warren, Hankins, Robertson, & Radford (1988). (Canada)	•8% of grade 7 students had sexual intercourse once. •26% of grade 9 students had sexual intercourse once. •47% of grade 11 students had sexual intercourse once. •33% always used a condom.
Leonard (1988). (US)	•Average age of African-American college males at first intercourse was 12 years of age. •85% of respondents used contraception at least once.
Sonenstein, Pleck, & Ku (1989). (US)	•By age 17, 66% of never married males had sexual intercourse once. •57% of this group used a condom at last intercourse

Do sexually active adolescents use contraception methods? Sexual activity does not seem to translate into consistent contraceptive behavior. For instance, data from a 1979 American survey indicated that 49% of the females in the 15 to 19 age group and 44% of the males in the 17 to 21 age group used a contraceptive method at first intercourse (Zelnik & Shah, 1983). The findings of a 1981 Calgary survey indicated that 54% of sexually active adolescents used a contraceptive method at first intercourse and 75% of adolescents used a contraceptive method at last intercourse. Among male African-American college students, 85% reported having used some form of contraception (Leonard, 1988). In terms of condom use, a study of Canadian youths and AIDS revealed that only 33% of the respondents indicated using the condom during all their sexual encounters (King et al., 1988). Finally, the condom use reported by American males in the 15 to 19 age group has increased between 1979 and 1988 from 21% to 57% (Sonenstein, Pleck, & Ku, 1989).

Unfortunately, these statistics do not provide a clear picture of the percentage of adolescents who *correctly* and *consistently* use contraceptive methods. Such statistics are difficult to obtain. Examination of the estimated pregnancy rate however, reveals the lack of consistent and correct contraception by adolescents. The estimated pregnancy rate represents the number of live births, still births and therapeutic abortions per 1000 females. In 1985 the estimated teenage pregnancy rate for the US was 110/1000 (Voydanoff & Donelly, 1990). It is one of the highest teenage pregnancy rate in all industrialized countries. In Canada, for the 15 to 19 age group, the 1987 national estimated pregnancy rate was of 40.6/1000. For the same year, Alberta was above the Canadian average with a rate of 54.1/1000, ranking third highest behind Manitoba at 60.3/1000 and Saskatchewan at 57.3/1000 (Wadhera & Silins, 1990). In 1990, the estimated pregnancy rate for this age group in Alberta was 51.9/1000 (Alberta Health, 1991).

A number of reasons for the inconsistent contraception behavior in adolescents has been elicited by research. Poor contraception knowledge and the belief in the impossibility of becoming pregnant were two reasons identified by a Calgary survey (Meikle, Peitchinis, & Pearce, 1985). The belief that planning contraception may be perceived to be linked to promiscuity, the threat of embarrassment when purchasing contraceptives as well as a lack of sexual education were identified as sources of inconsistent contraceptive behavior by Herold (1984). Furthermore, a negative attitude toward sex can also discourage responsible contraception while not discouraging sexual activity (Fisher, Byrne & White, 1983).

In a 1979 American survey, females who did not practice contraception indicated that 1) they had not planned their first sexual intercourse and had not been prepared to practice contraception, 2) they chose not to use contraceptives or 3) they did not know about contraception. As for the males, they indicated that 1) they did not want to practice contraception, 2) contraceptives were not available, 3) they had not planned to have sex or 4) they did not know about contraception (Zelnik & Shah, 1983). Finally, researchers suggest that lack of sexual and contraceptive knowledge does not prevent sexual intercourse but may inhibit proper contraceptive behavior (Allgeier, 1983).

In light of these research findings, the lack of contraceptive knowledge in adolescents would seem to be one major source of inconsistent contraceptive behavior. The assumption is that responsible sexuality and consistent contraceptive behaviors are grounded in sound knowledge. Therefore, it becomes necessary to examine the sources of contraceptive information and the impact of sexuality and contraceptive education on contraceptive knowledge, attitude and behavior of adolescents.

Sexuality and Contraceptive Education

Many sources of sexuality information for adolescents have been identified. Research findings suggest that peers are often the most important source of information about sexuality (Meikle, Peitchinis, & Pearce, 1985; Pope, Westerfield & Walker, 1985). Still, this source of information is, for the most part, inaccurate (Orbuch, 1989; Pope, Westerfield & Walker, 1985). Parents who are generally recognized as having primary responsibility for the sexuality education of their children are not always the most accurate transmitters of information (Krupa, 1990; Meikle, Peitchinis, & Pearce, 1985). A third source of sexuality information is the media (Pope, Westerfield & Walker, 1985). Soap operas and cable channels such as Much Music portray sexual behaviors in a superficial way and send the message that sex outside marriage is acceptable (Orbuch, 1989; Strouse & Fabes, 1985). Contraception, however, is not portrayed by the media as a fundamental element of sexual behavior (Orbuch, 1989). Finally, research has demonstrated that school programs, the fourth source of contraceptive information, seem to provide accurate information related to contraception (Pope, Westerfield & Walker, 1985). School programs do increase knowledge (Kirby, 1985), although sometimes only marginally (Meikle, Peitchinis, & Pearce, 1985).

In Alberta, school programs have assumed some responsibility in providing information regarding sexuality to ensure that students can deal appropriately with pressure from peers and society (Alberta Education, 1986). The importance of sexuality education is recognized and since 1990, has been mandatory in junior and senior high schools in Alberta. The aim of formal sexuality education programs is the promotion of responsible sexuality and the prevention of unwanted pregnancies and sexually transmitted diseases in adolescents. Junior high school programs in Alberta integrate sexuality education within the health and personal life skills curriculum. The overall goal of this curriculum is "student growth in relevant knowledge, healthy attitudes, and effective lifelong skills in the four main health dimensions: physical, intellectual, social/personal, and ethical/moral" (Alberta Education, 1986, p. 6). Like most sexuality education programs, the health and personal life skills curriculum of Alberta Education supports the choice to abstain and the postponement of sexual intercourse.

The sexuality education component of the Alberta Health Curriculum does not appear to have been formally evaluated (Krupa, 1990). The only study from Alberta to evaluate the impact of sexuality education on contraceptive knowledge, attitude and behavior of adolescents was conducted prior to the implementation of the Alberta Health Curriculum. It showed that contraceptive education only marginally increases knowledge related to contraception (Meikle, Peitchinis, & Pearce, 1985).

In the US, several investigations have evaluated the impact of sexuality education programs on contraceptive knowledge, attitude and behavior. These studies indicate that contraceptive knowledge increases after exposure to sexuality education programs (Kirby, 1985) and that contraceptive attitude may be influenced by sexuality education (Leonard, 1988). Overall, no studies have clearly demonstrated a significant effect of school based education on contraception beyond knowledge (Allgeier, 1983; Dawson, 1986; Marsiglio & Mott, 1986; Stout & Rivara, 1989; Taylor, Wang, Jack & Adame, 1989).

Stout & Rivara (1989) posit that the quality of school based sexuality education programs could be the source of the lack of efficacy in influencing contraceptive behavior. This claim is partly supported by a study of the influence of teaching methods on health knowledge of adolescents. These particular findings indicate that poor interpersonal skills in teachers can nullify the effect of health instruction (Lohrmann & McClendon, 1987).

One successful pregnancy prevention program was evaluated by Zabin, Hirsch, Smith, Streett & Hardy (1986). This program consisted of a clinic in the neighborhood of four inner-city secondary schools (grade 7 to 12). The clinic offered a number of services including: sexuality education, individual counseling, medical services, contraception education, group counseling and contraceptive services. Zabin at al. (1986) found that the program yielded an increase in sexual and contraceptive knowledge in students in addition to 1) positive attitudes about contraception , 2) a postponement of sexual intercourse, 3) an increase in the use of contraceptives requiring planning and 4) an increase in the effective use of contraceptives. The key to the success of this program was partly due to the accessibility of the staff rather than on the "new" information provided.

In Alberta, an alternative sexuality education program, developed to encourage the postponement of the onset of sexual activity in adolescents, was evaluated. A number of people such as adolescents, parents and community representatives participated in the development of the program. The education program was then given over two days during the weekend. Both parents and their children attended the two day program. Findings revealed that by the end of the education program, the consequences of sexual activity, such as the occurrence of sexually transmitted diseases and, in particular, the emotional consequences of sexual activity were not well understood by the adolescents. Furthermore, the information about contraceptives was perceived by the adolescents as incomplete (Krupa, 1990).

A number of arguments have been presented in an attempt to explain why school based sexuality education program fail to positively influence contraceptive behavior. First, it is argued that the expectations about these programs are unrealistic. In contrast to other courses where an increase in knowledge is the only measure of effectiveness, changes in knowledge, attitude and behavior represent the means by which effectiveness is established for sexuality education programs (Kirby, 1989, cited in Krupa, 1990). Second, students may not be at a cognitive level permitting them to understand the consequences of sexual behaviors. They may not have reached the operational cognitive level necessary to envision long term consequences of their acts (Elkind, 1984). Moreover, adolescents may have the perception of being invincible which negates the occurrence of consequences such as unwanted pregnancies (Elkind, 1984; Jorgensen, 1981; Zelnik & Kramer, 1980, cited in Krupa, 1990). Third, the pretense of being knowledgeable about sexuality issues represents a means by which adolescents in general avoid embarrassment in front of their peers (Campbell & Golick, 1988; Jorgensen, 1981). Research on the concept of embarrassment indicates that its occurrence is highest in adolescents between the ages of 11 and 15 (Horowitz, 1962). Interestingly, the findings from research also suggest that guilt or embarrassment about sexual matters may lead an individual to avoid or "tune out" information related to sexuality and contraception (Gerrard, Kurylo & Reis, 1991).

New directions have been proposed to increase the effectiveness of sexuality education programs in schools. Jorgensen (1981) suggests a focus on what is perceived by adolescents as embarrassing as opposed to a focus on what adults believe adolescents need to know. For instance, the content could address issues of sexual development and contraception rather than discuss effective parenting. Atwater (1988) posits that sexuality and contraception education should occur in a confidential atmosphere. Still others emphasize that sexuality and contraception education should be personalized and non-judgmental (CTS, 1991; Jorgensen, 1981; Kirby, 1985). A personalized approach to sexuality education, with an emphasis on how to obtain and use contraceptives, could result in a higher knowledge gain for adolescents (Fisher, 1983; Jorgensen, 1981). A discussion on how the computer medium can provide the necessary flexibility to implement these approaches is presented in the following section.

Computer-Assisted Instruction (CAI)

Research findings suggest that the computer is an effective instructional method. A meta-analysis of CAI programs in secondary schools indicated an increase in examination scores of 0.4 standard deviation (medium effect size) for students being taught via computers. Furthermore, students being taught via CAI programs had a more positive attitude toward computers and instruction than those who did not learn via CAI programs. There is also evidence from the meta-analysis that CAI programs are effective with intellectually disadvantaged students (Bangert-Drowns, Kulik & Kulik, 1985). Some researchers have investigated the effectiveness of a computer simulation to enhance students' learning of a unit on health. Their findings indicated that the combination of structured teaching with a computer simulation was effective in teaching problem-solving skills of a higher cognitive level to mildly handicapped students compared to mildly handicapped students who received structured teaching only (Woodward, Carnine & Gersten, 1988).

The characteristics of an effective CAI program make the computer a medium of choice for sexuality education. These characteristics (Billings, 1986). include:

1. Non-threatening environment
2. Learner control
3. Simulated life-situations
4. Privacy
5. Interactive environment
6. Immediate feedback

In light of these characteristics, teaching about contraception via the computer may be less embarrassing to students and teachers. If sound instructional design principles were employed during the development of a CAI program then the computer medium would provide a confidential, personalized and non-judgmental environment for learning about contraception.

Investigators have examined the possible influence of the computer on sexual and contraceptive knowledge, attitude and behavior of adolescents and young adults. For instance, DeSonier (1982) evaluated the effect of a CAI program on contraception knowledge, attitude and behavior of college students. Sixty-three undergraduate students volunteered for this study. The findings indicated that the CAI program does increase contraceptive knowledge but does not influence contraceptive attitude or behavior. Interestingly, when the CAI program was presented in conjunction with group interaction, there was a significant positive change in the contraceptive attitude of the students.

Three major studies on the effects of CAI programs on sexuality and contraception have been published. The first study, by Kann (1987), evaluated the effects of a simulation-based CAI program on selected interaction skills related to responsible sexuality. The study was quasi-experimental in design and the sample consisted of 391 students from four secondary schools in three mid-Western states. The students were registered in grade 7 to grade 12, 55% being in grade 10 and

33% being white. Entire classes were assigned either to the CAI program classroom (experimental group), to the regular instruction classroom (control group #1) or to the no instruction classroom (control group #2). The students in the regular instruction group were taught by their teacher and received the same material as those in the CAI program group. The investigator observed all of the regular instruction classes. A pre-test, a post-test and a five weeks delayed test were administered. The independent variables were:

- instruction about interaction skills related to responsible sexuality;
- grade;
- gender;
- school-community setting.

The dependent variables were:

- decision-making knowledge and behavior;
- assertiveness knowledge, attitude and behavior;
- interpersonal communication knowledge, attitude and behavior;
- effect of the CAI program depending on grade, gender and school-based community setting.

When measured after instruction, many dependent variables yielded significant increases for the students in the CAI program classroom. The measurement of the dependent variables at post-test and five weeks after instruction did not yield any significant increase for the students in the regular instruction classroom. Table 2 presents some of the results from the study by Kann (1987).

The results from this evaluation study suggest that the simulation-based CAI program is an effective instructional method for increasing interaction skills related to responsible sexuality. At the delayed test, students in the CAI program group scored significantly higher than at pre-test on the variables decision-making behavior, assertiveness behavior and interpersonal communication attitude and behavior but did not score significantly higher on the variables decision-making knowledge, assertiveness knowledge and interpersonal communication knowledge. The decay observed in decision-making knowledge, assertiveness and in interpersonal communication knowledge over the five week period is a common limitation of education. More importantly however, attitudes and behavior did not decrease significantly during this time period (Kann, 1987).

Table 2: Dependent Variables From Kann's Study that Significantly Increased Following Instruction via the CAI Program

Independent variables	**Dependent Variables: Significant Increases**	
	Post-Test	**Delayed Test**
CAI group Undifferentiated	•*Decision-making* knowledge and behavior; •*Assertiveness* knowledge and behavior; •*Interpersonal communication* knowledge, attitude and behavior.	•Decision-making behavior; •*Assertiveness* behavior; •*Interpersonal communication* attitude and behavior.
Females in CAI group	•Decision-making knowledge; •*Assertiveness* knowledge and behavior; •*Interpersonal communication* knowledge.	
Males in CAI group	•*Decision-making* knowledge and behavior; •Assertiveness knowledge and behavior; •*Interpersonal communication* attitude and behavior.	
Grade 7 & 8 in CAI group	•*Decision-making* knowledge and behavior; •Assertiveness behavior	
Grade 9 & 10 in CAI group	•Decision-making behavior; •*Assertiveness* behavior; •*Interpersonal communication* knowledge. attitude and behavior	
Grade 11 & 12 in CAI group	•*Decision-making* knowledge and behavior; •*Interpersonal communication* knowledge and behavior	
Urban schools in CAI group	•Assertiveness behavior; •*Interpersonal communication* knowledge and attitude	

In her conclusion, Kann (1987) explained that the life simulations provided in the CAI program enable the learner to see the consequences of her/his actions without the cost associated to real-life situations. She added that the CAI program may help students grasp abstract concepts more easily than the lecture format. In addition, the CAI program can provide a risk-free, private environment for students to practice interaction skills related to responsible sexuality whereas role playing and other group activities could be embarrassing and unrealistic to some students. Finally, the CAI program may also provide an environment to freely explore consequences of behaviors without the risk of affecting students' self-esteem or social status. Thus, the author claimed that the CAI program can promote positive changes related to sexuality without the risks inherent in regular classroom instruction involving such sensitive topics. Overall, the CAI program may contribute to improving adolescents' health status as well as the interaction skills related to responsible sexuality and their health status (Kann, 1987).

A second study conducted by Alemi, Cherry & Meffert (1989) consisted of a two part evaluation of a computer game helping adolescents to make decisions about sexuality issues. In the first part, the investigators determined the reactions of students to the game. The study group was composed of 15 year old students of which 56 were females and 35 were males. The subjects, who attended an urban public school in New Orleans were asked to answer a questionnaire after completing the computer game. Eighty-four percent of the females and 80% of the males said they would talk to their parents about the computer game. Sixty percent of the females and 66% of the males stated they could now discuss sexuality issues with greater ease after playing the game. Finally, 52% of the subjects claimed their future actions would be influenced by the game.

In the second part of their evaluation, the authors tested the program with 40 adolescent females who had been pregnant once. The design was quasi-experimental with a control and a treatment group. Twenty females were randomly assigned to the treatment group. They received a pre-test and a post-test measuring their locus of control, their sexual attitude and their sexual knowledge. The independent variable was the instruction on the consequences of sexual activity. The control group received the same instruction via the lecture format. No differences were observed between the two group on the pre-test. The findings indicated no differences between the treatment and the control group in terms of sexual knowledge gain. The sexual attitude of the treatment group was however, significantly more liberal than the control group on the post-test. Finally, the computer game improved significantly the locus of control of the adolescents playing the game (Alemi, Cherry & Meffert, 1989).

The authors proposed that the change in attitude resulted from the socialization that occurred between the adolescent females during the game. "The game may have triggered communication about sexual issues" (Alemi, Cherry & Meffert, 1989, p.289). Furthermore, they argued that the improvement in the locus of control was a result of the repeated decisions made during the game as the females could see the consequences of their choices. The decision rehearsals may have helped them perceive they had an increased control over the way the events unfolded (Alemi, Cherry & Meffert, 1989).

Finally, a third study was conducted in Hawaii by Paperny & Starn (1989) who evaluated two computer games through quasi-experiments using the untreated control group design with pre-test and post-tests for each computer game. One program was called the "Baby Game" and the other was called "Romance." The population was composed of adolescents 13 to 18 years of age and living in Hawaii. Three hundred and fifty-one students participated in the evaluation of the "Baby Game" while 367 participated in the evaluation of the "Romance" program. The independent variables were the instruction on parenting implications and the instruction on communication skills and contraception.

The findings from this study indicated that the "Baby Game" program increased the students' knowledge of parental implications while the "Romance" program increased the students' knowledge about contraception. In addition, the "Romance" program positively influenced the attitude of the students about contraception. On a scale of 1 to 5, the students rated the "Baby Game" program at 3.9 and the "Romance" program at 4.3. The authors also evaluated the two programs in a pediatric clinic for one year. They claimed that a decrease of 15% in adolescent pregnancies was observed after the implementation of the two computer programs. They also noted that couples attending the clinic and especially the males, enjoyed the games (Paperny & Starn, 1989).

In their conclusion, these two authors suggest that computer-assisted instruction may be a useful tool in the prevention of adolescent pregnancy. CAI programs may improve decision-making because adolescents can simulate the implementation of their decisions and observe the consequences of their choices. Moreover, adolescents can control the pace of learning which fosters more quality time to spend with the health professional. Finally, the authors argue that CAI programs related to sexuality can be economically implemented in a variety of educational and clinical settings (Paperny & Starn, 1989).

In summary, adolescents consider sexual intercourse to be normal at their age. The use of contraceptive methods is, however, not consistent with the sexual behaviors of adolescents and the teenage pregnancy rate supports this fact. In the province of Alberta, 54.1 pregnancies per 1000 females in the 15 to 19 age group were reported in 1987 and this represents the third highest pregnancy rate in Canada during that year. Sexuality education has been found to have no measurable impact beyond sexuality and contraceptive knowledge. Research shows that CAI programs can help junior high and high school students learn about sexuality and the consequences of sexual behaviors. Nevertheless, more research is necessary to support some of the findings of computer-assisted instruction related to contraception, particularly when this instruction is integrated into an established curriculum.

Of the three studies, Kann (1987) has controlled for the most factors, yet her study did not address directly the question of contraception. Moreover, the instructor factor could have been controlled by having the investigator teach all the classes in the control group. In the present study, the material factor and the instructor factors were controlled by having the investigator teach the control group using the lecture format. The study by Alemi, Cherry & Meffert (1989) did not measure the effect of the CAI program on knowledge in schools. In the present study, the effects of the CAI program and the lecture format on contraception knowledge were tested in schools. The study by Paperny & Starn (1989) did not compare their CAI programs to conventional methods of sexuality education. In contrast, the present study examined the effect of the CAI program on contraceptive knowledge in comparison with the conventional lecture method. Finally, none of the studies reviewed indicated having based the development of their CAI program on an accepted sexuality education curriculum. For the present study, the development of the CAI program was based on the Health and Personal Life Skills Curriculum approved by Alberta Education (1986) which guides sexuality education in the Alberta junior high schools.

CHAPTER 3: METHODS

This thesis consisted of four phases: 1) developing a CAI program, an instrument (quiz) to measure the students knowledge and a survey to estimate the reaction of the students to the CAI program; 2) establishing content-related evidence of validity for the CAI program, the quiz and the survey; 3) pilot testing the quiz and; 4) assessing the effect of the CAI program and the lecture format on contraceptive knowledge of grade nine students and determining if there was a difference in knowledge gain when the lesson on contraception was taught through the CAI program compared with the lecture format. In this chapter, the activities inherent to each phase will be described in detail. First however, the steps involved in the selection of the schools where the CAI program was eventually tested will be discussed.

Because of the sensitivity of the topic and because a collaboration between the researcher and the schools involved in the study was needed to develop a CAI program matching the schools' philosophy about contraception education, secondary schools were approached before beginning the development of the CAI program. The first school board contacted from a major city declined to participate in the research, but two other schools from different districts agreed to participate in the investigation. One school was located south of the major city (school A) and the second school was located north of the major city (school B). The researcher's early attempts at collaborating with the two schools probably ensured a stronger commitment to the project on their part. For instance, the sexuality education coordinators immediately provided information and a bibliography related to the content of contraception education presented at their respective schools and agreed to participate in the validation of the CAI program, the quiz and the survey.

Development of The CAI Program and The Quiz

The CAI program was developed in nine stages based on the principles of instructional design described by Dick & Carey (1990). The nine stages are as follows:

1. Needs analysis
2. Instructional goal
3. Instructional Analysis
4. Entry behaviors
5. Performance objectives
6. Criterion-referenced test items
7. Instructional strategy
8. Developing the instruction on the Macintosh™ computer using HyperCard™
9. Designing and conducting a One to One Formative Evaluation

Although the nine stages are presented in a linear format, in reality, many of them overlap or take place simultaneously. For example, a criterion-references test item must be written for each performance objective. Therefore, the development of the quiz took place concurrently with the development of the CAI program. As for the instructional strategy, it was determined before commencing the development of the CAI program although it is listed later in the process of instructional design. Finally, the formative evaluation was followed by revisions made to the previous stages. Therefore, the stages of instructional design should be viewed as a matrix of activities rather than occurring in separate steps.

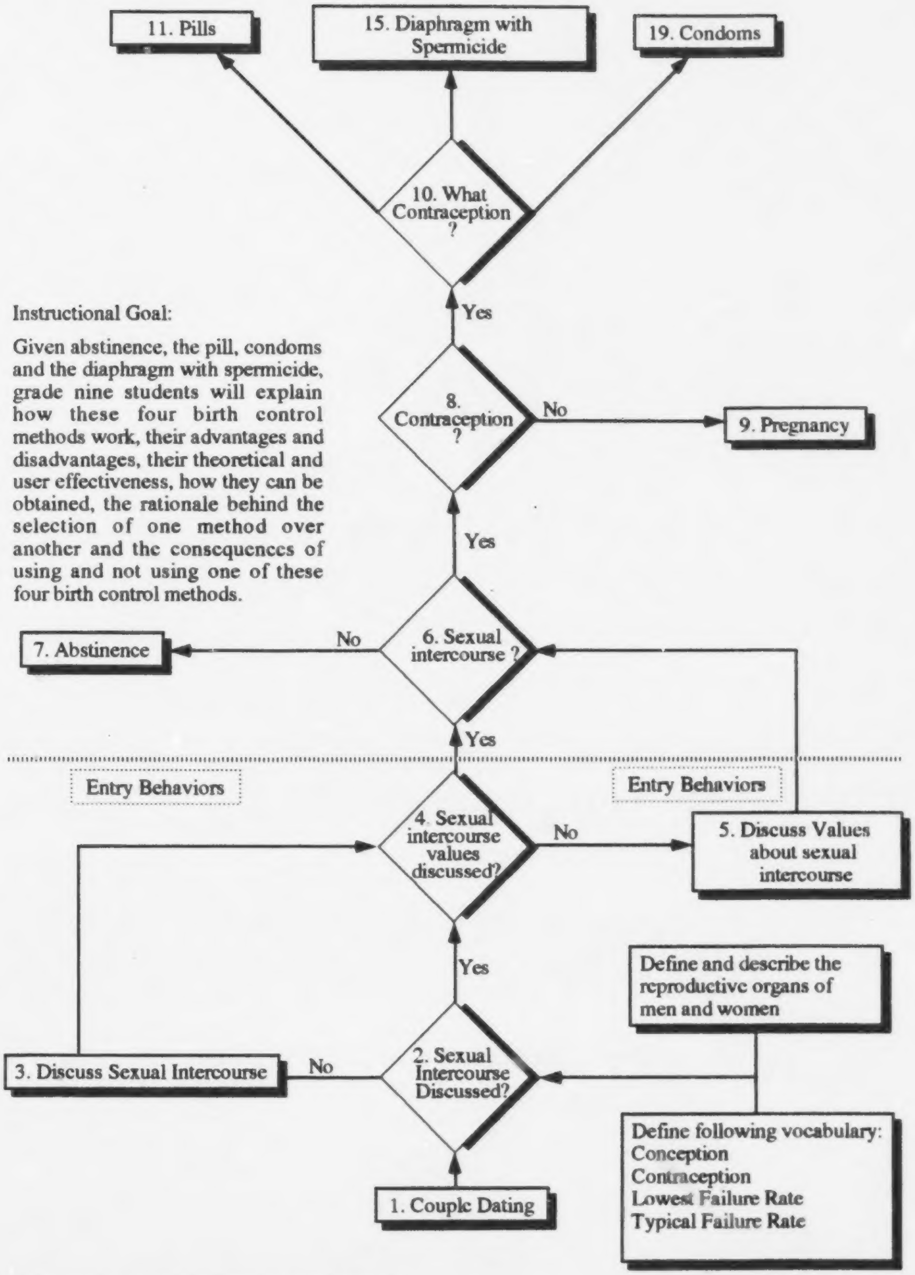
Designing the Contraception Lesson

The first stage of instructional design, the needs assessment, involves gathering information from all the individuals involved in the problem and its solution (Dick & Carey, 1990). One source of information utilized for this study was the local newspaper. Additionally, information was obtained from a sexuality education coordinator from one of the schools who participated in this study. Next, statistics related to the onset of sexual activity, contraception practices and the pregnancy rate among adolescents were obtained from the Alberta Government and scientific journals. Scientific periodicals also provided information regarding sexuality and contraception education. The Introduction and the Literature Review chapters represent the needs analysis.

At the conclusion of the needs analysis, the instructional goal was defined. The instructional goal, the second stage of instructional design, delineates in clear and general terms the outcome of instruction, that is, what the learner will be able to do at the end of instruction (Dick & Carey, 1990). The following was the instructional goal for the CAI program on contraception:

> Given abstinence, the pill, condoms and the diaphragm with spermicide, grade nine students will explain how these four birth control methods work, their advantages and disadvantages, their lowest and typical failure rates, how they can be obtained, the rationale behind the selection of one method over another; and the consequences of using and not using one of these four birth control methods.

The third stage, the instructional analysis, consists of determining whether the instruction is in the cognitive, affective or behavioral domain, then defining the skills and sub skills involved in reaching the instructional goal (Dick & Carey, 1990). The CAI program was targeted specifically at the cognitive domain. Figure 1 presents a decision tree leading to the selection of one of the four methods of contraception presented in the CAI program. Figures 2 to 5 show schematically the skills and sub skills necessary to make a decision for each contraceptive method.


11. Pills
15. Diaphragm with Spermicide
19. Condoms
10. What Contraception ?
Yes
8. Contraception ?
No
9. Pregnancy
Yes
No
7. Abstinence
6. Sexual intercourse ?
Yes
Entry Behaviors
Entry Behaviors
4. Sexual intercourse values discussed?
No
5. Discuss Values about sexual intercourse
Yes
Define and describe the reproductive organs of men and women
3. Discuss Sexual Intercourse
No
2. Sexual Intercourse Discussed?
Define following vocabulary:
Conception
Contraception
Lowest Failure Rate
Typical Failure Rate
1. Couple Dating

Instructional Goal:

Given abstinence, the pill, condoms and the diaphragm with spermicide, grade nine students will explain how these four birth control methods work, their advantages and disadvantages, their theoretical and user effectiveness, how they can be obtained, the rationale behind the selection of one method over another and the consequences of using and not using one of these four birth control methods.

Figure 1. Instructional Analysis

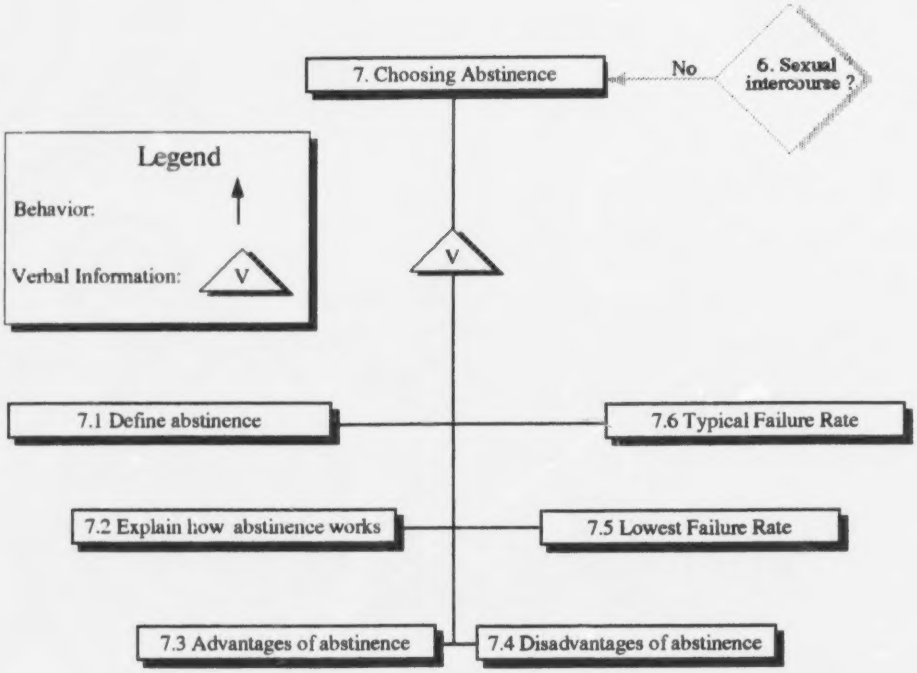

7. Choosing Abstinence
No
6. Sexual intercourse ?
Legend
Behavior:
Verbal Information:
V
V
7.1 Define abstinence
7.6 Typical Failure Rate
7.2 Explain how abstinence works
7.5 Lowest Failure Rate
7.3 Advantages of abstinence
7.4 Disadvantages of abstinence

Figure 2. Detailed Instructional Analysis of Abstinence

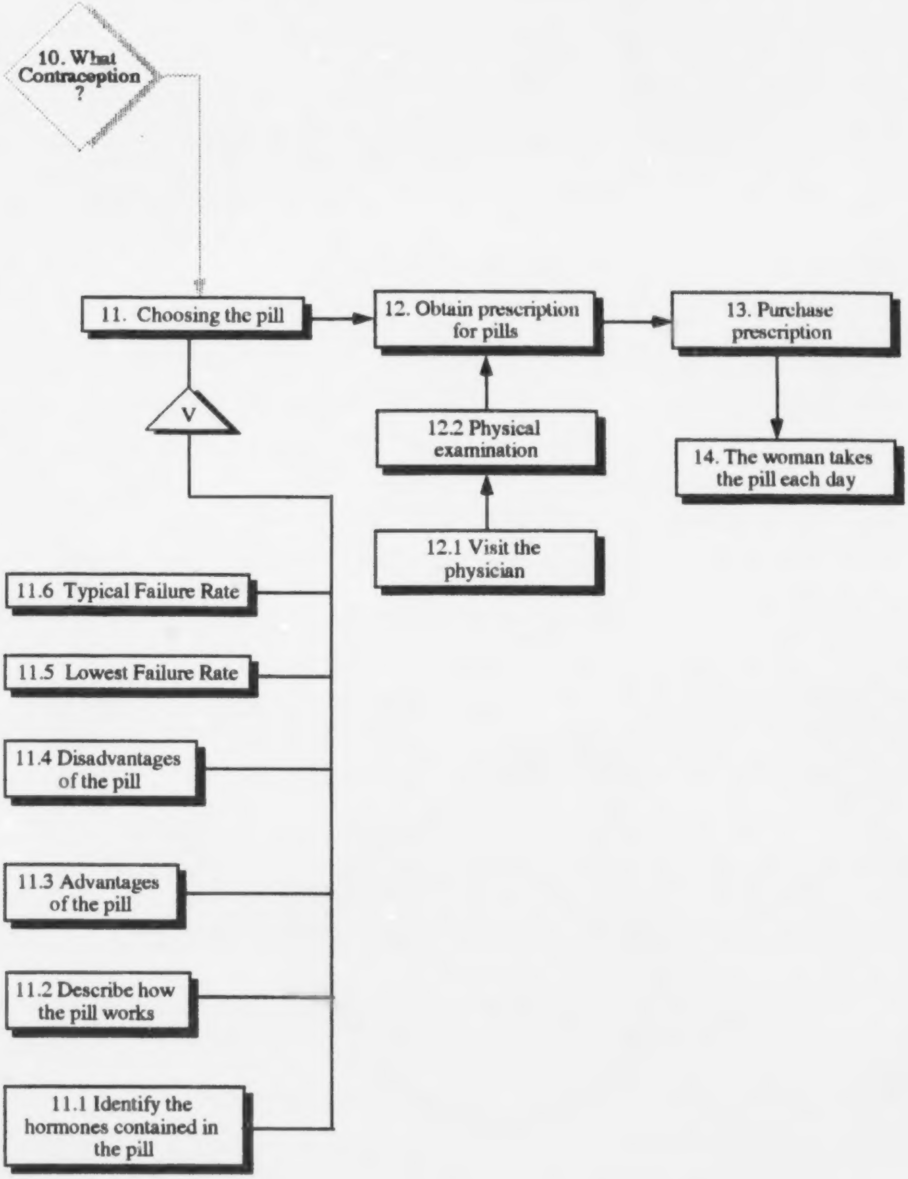

10. What Contraception ?
11. Choosing the pill
12. Obtain prescription for pills
13. Purchase prescription
12.2 Physical examination
14. The woman takes the pill each day
V
12.1 Visit the physician
11.6 Typical Failure Rate
11.5 Lowest Failure Rate
11.4 Disadvantages of the pill
11.3 Advantages of the pill
11.2 Describe how the pill works
11.1 Identify the hormones contained in the pill

Figure 3. Detailed Instructional Analysis of the Pill

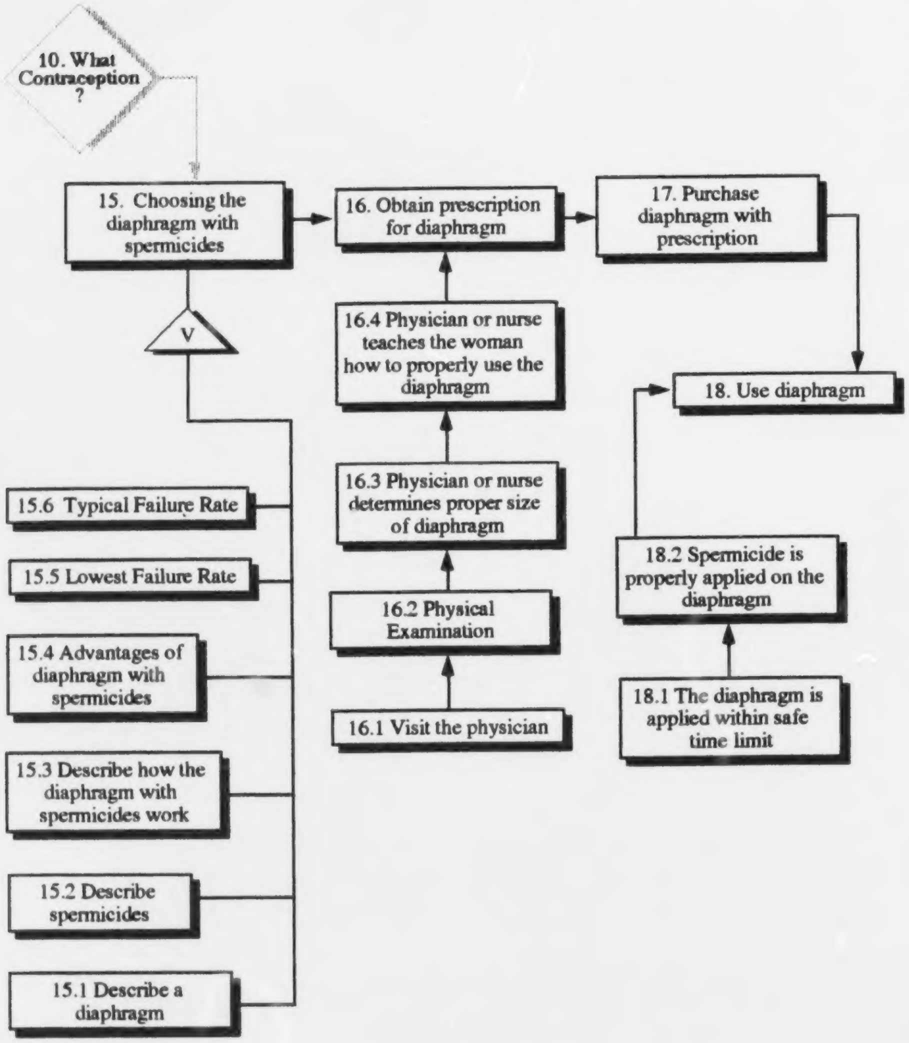

10. What Contraception ?
15. Choosing the diaphragm with spermicides
16. Obtain prescription for diaphragm
17. Purchase diaphragm with prescription
V
16.4 Physician or nurse teaches the woman how to properly use the diaphragm
18. Use diaphragm
15.6 Typical Failure Rate
16.3 Physician or nurse determines proper size of diaphragm
15.5 Lowest Failure Rate
18.2 Spermicide is properly applied on the diaphragm
16.2 Physical Examination
15.4 Advantages of diaphragm with spermicides
16.1 Visit the physician
18.1 The diaphragm is applied within safe time limit
15.3 Describe how the diaphragm with spermicides work
15.2 Describe spermicides
15.1 Describe a diaphragm

Figure 4. Detailed Instructional Analysis of the Diaphragm

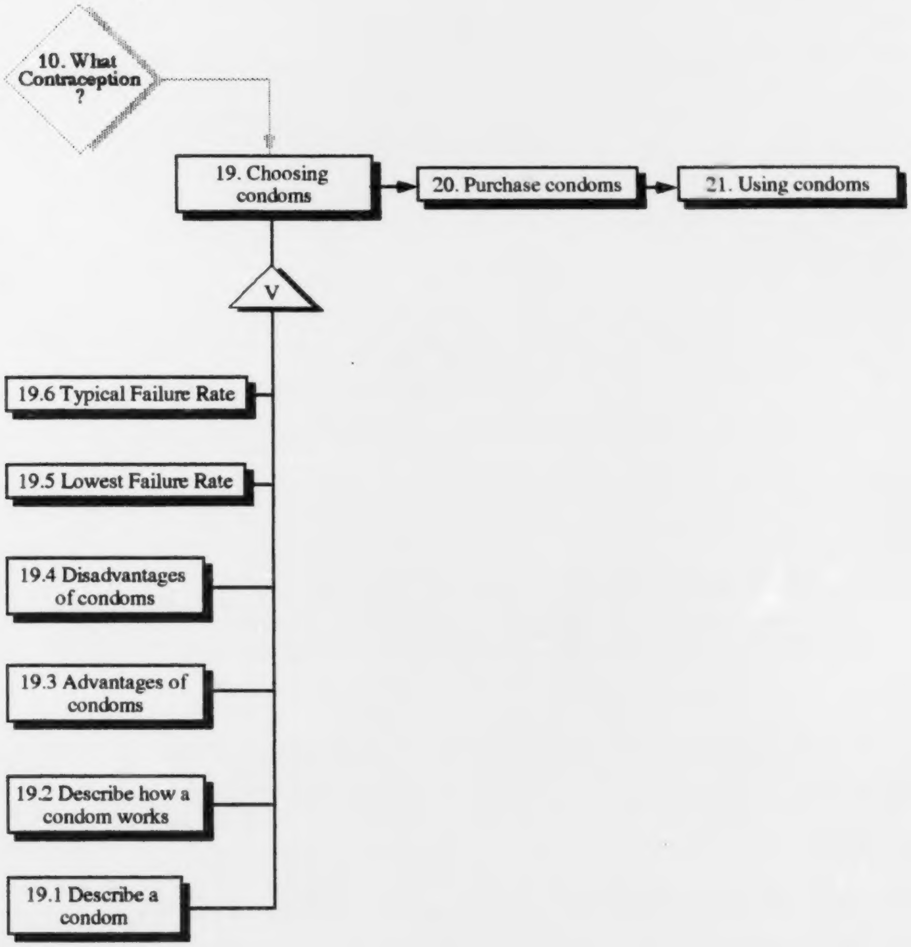

10. What Contraception ?
19. Choosing condoms
20. Purchase condoms
21. Using condoms
V
19.6 Typical Failure Rate
19.5 Lowest Failure Rate
19.4 Disadvantages of condoms
19.3 Advantages of condoms
19.2 Describe how a condom works
19.1 Describe a condom

Figure 5. Detailed Instructional Analysis of the Condom

The fourth stage consists of determining the entry behaviors, that is, all the skills the learner should have acquired prior to taking the unit of instruction on contraception (Dick & Carey, 1990). According to the Health and Personal Life Skills curriculum (Alberta Education, 1986), in grade seven and in grade eight, students reviewed the reproductive organs of both men and women and learned about conception, values, assertiveness in couples and decision-making. Figure 1 presents the entry behaviors schematically, based on previous curriculum content. By grade nine, students should have been able to define and describe the reproductive organs of men and women and define the following vocabulary: Conception, contraception, ovulation, sperm, ovum, penis, vagina, uterus, cervix, hormones. Before receiving information on contraception, grade nine students are to review material covered in the two previous years and should be aware that partners discuss issues such as their respective values related to sexuality and sexual intercourse.

The performance objectives and the criterion-related referenced test items, which correspond to the fifth and the sixth stages respectively, were achieved concurrently. Performance objectives provide a detailed description of the expected behavior of the students after completing the instruction. They include "the conditions under which the skill will be performed, the skill to be performed, and the criteria for assessing the performance" (Dick & Carey, 1990, 102). The performance objectives were constructed around three key skills which are 1) selecting a contraceptive method, 2) obtaining the method and 3) using the method effectively. Furthermore, the first skill included several key sub skills around which performance objectives were developed. These sub skills are: 1) what is the nature of the method, 2) how does it work, 3) what are the advantages, 4) what are the disadvantages, 5) what is the lowest failure rate of the method and 6) what is the typical failure rate.

Criterion-referenced test items are constructed to measure explicitly each performance objective. They are useful for providing information about the student's progress and the effectiveness of the instruction (Dick & Carey, 1990). Describing performance objectives and defining criterion-referenced test items proved to be very useful as the quiz emerged from the compilation and logical ordering of all the criterion-referenced test items. Forty-three performance objectives were developed. Five performance objectives shared test items. Because the shared test items appeared only once in the quiz, the quiz contained a total of 38 items. Twenty-seven questions were multiple choices with one option out of four being the correct one. The last eleven items were different as more than one option could be selected for each item. The cover page contained a request for demographic information such as age, gender and class number. In addition, the following questions were asked:

> Have you used a Macintosh™ computer before?
> Have you received information related to the grade nine lesson on contraception **in** school?
> Have you received information related to the grade nine lesson on contraception **outside** school?

These questions could be answered by checking one of the boxes marked "Yes" and "No." The second part of the cover page contained instructions to complete the quiz. The performance objectives and their corresponding test items are listed in Appendix A. The quiz is presented in Appendix B.

The seventh stage of instructional design, the instructional strategy, includes delineating the pre-instructional activities, the information presentation, the student participation, the testing and the follow-through (Dick & Carey, 1990). Briefly, a pre-test of contraceptive knowledge was to be administered to grade nine students, followed by the instruction either via the computer or through the lecture format and a post-test administered one week later. A follow up, however, was not planned as part of this research. The students in the control group who received the unit of instruction through the lecture format were taught by the researcher, thus allowing for control over the instructor factor and the content being taught. As for the CAI program, an outline is presented in the following paragraphs.

The tutorial type of instruction was selected for the present CAI program. According to Alessi & Trollip. (1991) tutorial lessons are appropriate for providing factual information and for providing guidance without extended practice. The CAI program followed the tutorial format to ensure that a majority of students would complete the lesson in forty minutes. The CAI program was divided in six sections: *Introduction, Abstinence, The Pill, The Diaphragm, The Condom* and *Choosing a Contraceptive Method.*

The computer controlled the lesson rather than the students. For instance, students had to complete the section on abstinence before starting the lesson on oral contraceptives. Also, the tutorial followed a linear format for all the section except the section entitled "Choosing a Contraceptive Method." The computer control and the linear sequence were selected for two reasons. First, these two tutorial features appeared to be appropriate for a beginning designer. Second, for research purposes, the linear sequence and the computer control helped ensure that the majority of the students covered a similar amount of content by the end of the course period. This was thought to be an important control measure to ensure that both the computer group and the lecture format group received the same information.

Development of the Computer Program

The CAI program started with a number of questions regarding myths and facts of contraception. There was a short feedback corresponding to the selelction of the button "myth" or the button "fact" followed by a lengthier information paragraph. The paragraph of information was the same whether the student had pushed the "myth" button or the "fact" button. Afterward, the four methods of contraception and objectives of the lesson were presented. Then, the menu appeared indicating each section. Only the sections not dimmed could be selected. Questions were embedded within each section. The questions appeared either to introduce a topic or following the presentation of information. The final section, entitled "Practice," used a branching system. The students made a decision about sexual intercourse and contraception and saw the result in the form of failure rate (percentage of pregnancy after one year).

The first version of the CAI program did not contain a glossary of terms but, following review, this was added to the second version. Students could access the glossary from anywhere in the program simply by pressing a button. Also, a visual effect imitating a slide projector was included to indicate a change in subject either within a section or when returning to the menu after completing a section.

A "Quit" button was built into the program for those instances where a student did not complete the lesson in one class period or wanted to return to the CAI program. Upon returning to the lesson, the student was presented with the last display screen viewed before quitting. From there, with the help of arrow buttons, the student was able to resume navigation through the lesson.

The eighth stage consists of deciding the format taken by the instruction. It was determined that for the treatment group, the lesson on contraception would be taught through the CAI program whereas for the control group, the lesson would be taught via the lecture format. In terms of instructional material, many illustrations were included in the CAI program. The illustrations were commissioned from an artist who is also a nurse. The instructional material employed with the control group was a birth control kit, which included a sample of an oral contraceptive container, spermicide foam and jelly, a diaphragm and a condom.

The Macintosh™ computer was selected for the treatment group because it has a visual interface is easy to use and it provides strong support for graphics. Moreover, the Macintosh™ is utilized in many Alberta schools. The software used to develop the CAI program was HyperCard™, the hypermedia software for the Macintosh™ computer. HyperCard™ was selected because it is quite flexible and because the researcher had experience scripting (programming) in HyperTalk™, the computer language that supports HyperCard™. The product developed with HyperCard™ is called a stack. HyperCard™ has objects such as buttons, text fields, cards, backgrounds and the stack itself, all of which can be assigned properties or functions. A number of properties and functions can be selected simply by clicking the mouse, therefore knowledge of a computer language is not necessary to develop a stack. Nevertheless, the researcher used HyperTalk™ to enhance the quality of the CAI program.

Formative Evaluation

The last stage of the instructional design, the formative evaluation consists of having the instruction tested by other experts and by members of the target population (Dick & Carey, 1990). Four formative evaluations took place before the CAI program was evaluated in the schools, the first one being conducted by a sexuality education coordinator and the other three being completed by 13 and 14 year-old adolescents who gave verbal agreement about their participation in this study. Two formative evaluations occurred after the first version of the CAI program was completed. The sexuality education coordinator had an overall positive impression of the CAI program. She proposed recommendations, which included providing easier navigation throughout the CAI program, adding key information and improving the syntax and grammar of some sentences.

A Macintosh™ computer was taken to the home of a 13 year-old male registered in grade nine at a French immersion school for a second evaluation. Although the subject had some hesitation prior to the researcher's arrival, once he saw the computer, he did not hesitate to volunteer for the evaluation. It took him approximately 40 minutes to complete the instruction, despite some problems found in the CAI program during this time. He claimed to have learned new information and said he enjoyed the program. He found the illustrations appropriate. The most important recommendation made by this evaluator was the lack of a list of terms. He suggested that it be called "Definitions." The second version of the CAI program corrected this problem by creating a glossary and a button which allowed access to the glossary from anywhere in the computer lesson. As suggested, the glossary was entitled "Definitions." A problem was found when the evaluator had to "drag" an object over the screen with the mouse. In the section on oral contraceptives, the learner is asked to drag the names of the two hormones over the figure of a pill. In this instance, the object could not be dragged. This turned out to be a difficult problem but was rectified in time for the last formative evaluation, a few days before the CAI program was scheduled to be tested in the schools.

Prior to the third and fourth formative evaluations, a second version of the program was completed. The major revisions were 1) the addition of a list of terms, 2) the change in the symbols representing the navigational tools, 3) the improvement of navigational instructions at the beginning of the CAI program and 4) the addition of a final section where students could write their comments about the CAI program. Symbols such as left bound and right bound arrow buttons replaced the "Back" and "Continue" buttons. Instruction regarding these navigational buttons was improved and simplified at the same time.

A 14 year-old male, registered at the grade nine level in a French immersion school was the third person from the target population to evaluate the CAI program. He completed the instruction in 30 minutes. Again, in the section on oral contraceptives, the evaluator could not drag the names of the hormones over the figure of the pill despite earlier efforts by the researcher to resolve this problem. Finally, this problem was resolved for the last formative evaluation, done in the home of a 14 year-old female, also registered at the grade nine level in a French immersion school. She completed the lesson in 30 minutes and did not uncover new problems. The attention of these last evaluators appeared to have been sustained throughout the lesson since they did not respond to distractions from the surrounding environment while going through the lesson. Both seemed to have enjoyed learning about contraception through the computer.

Finally, a survey was developed to assess the reaction of the students who received the unit of instruction via the computer (see Appendix C). The survey was composed of nine statements. One statement read as follows: "Learning about birth control on the computer took away the threat of embarrassment." Another stated: "I felt I understood what the objectives of the lesson were." The students were asked to indicate their response by circling one of the following statements: "strongly disagree," "disagree," "neutral," "agree" or "strongly agree."

Content-Related Evidence of Validity for the Quiz and the Survey

Before estimating the effect of instruction on contraceptive knowledge of grade nine student, a pilot study had been planned in order to carry an item analysis of the quiz. Therefore, it was necessary to first establish content-related evidence of validity for the quiz. The survey was also validated at this time. A committee of experts was formed for this validation process. The committee was composed of two sexuality education coordinators from each school and a community health nurse specializing in human sexuality. Each member received one validation package which included the quiz (Appendix B) and the survey (Appendix C). A second validation package was sent later for the CAI program.

The validation package contained material to conduct an evaluation of the quiz and the survey (see Appendix D). The material for the quiz included 1) validation instructions; 2) one checklist numbered 1 to 38 for the quiz and; 3) a list of performance objectives. The numbers on the checklist matched test items.

For the survey, the material to conduct the evaluation included 1) validation instructions and 2) a checklist numbered 1 to 9 for the survey. The numbers on the checklist corresponded to the survey questions (Appendix D).

Representativeness is the key to the establishment of content-related evidence of validity (Popham, 1990). Accordingly, the evaluators were asked to make judgments about the following characteristics of the quiz:

-Curricular Validity:
  Does the item measure the objective as presented in the Performance Objectives?
-Technical Adequacy:
  Is the item free of errors?
  Is the wording of the item appropriate?
  Is the specified keyed response (statement with the bold letters) the correct answer?
  Does the item as it is presented provide clues to the keyed response of other items?
-Appropriateness of item content and presentation:
  Is the item offensive in any way?

Following are the criteria that members were asked to use for judging each characteristic:

-**Acceptable**:
  In terms of the specified characteristics, the item is acceptable as is.
-**Revise**:
  In terms of the specified characteristics, the items is acceptable with some revision.
-**Reject**:
  In terms of the specified characteristics, the item is unacceptable.

If they found an item acceptable, no entry was required on the checklist. If they judged that an item needed revision, they were asked to indicate this by placing a check (√) in the appropriate place in the checklist **and** by indicating their suggestion for revision on the test beside the item in question. If they judged that an item was unacceptable, they were asked to place a check (√) in the appropriate place in the checklist **and** to indicate their reason for rejection on the test beside the item in question.

As for the survey, the evaluators were asked to determine if each question met the following three characteristics: meaningfulness, clarity and relevancy. All the questions on the survey were found to be meaningful, clear and relevant to assessing the students' reactions to the CAI program.

Few items on the quiz were judged to require revisions. Suggestions were made to improve the wording of some items. Only one item was rejected by all five evaluators. This item related to the disadvantages of abstinence and was perceived to indirectly encourage sexual intercourse over abstinence. As a result of the validation process, the quiz comprised a total of 37 questions.

Content-Related Evidence of Validity for the CAI Program

The validation package for the CAI program contained 1) instructions for validation, 2) checklists, 3) a hard copy of the CAI program and 4) a list of performance objectives. One checklist was provided for each of the following sections: introduction, menu, abstinence, oral contraceptives, the diaphragm, the condom and the decision-making section. The numbers on the checklist could each be matched to a number appearing in the upper left corner of each page of the hard copy. Again, the performance objectives were provided for comparative purposes. The validation instructions for the CAI program are presented in Appendix E.

Keeping in mind that representativeness is the key element of content-related evidence of validity, the evaluators were asked to make judgments about the following characteristics for the screens:

-Curricular Congruency:
    Does the information provided on the screen(s) meet the objectives stated in the list of Performance Objectives?
-Classroom parallel:
    Does the content parallel the information on contraception methods presented in the classroom.
-Appropriateness:
    Is the content at an appropriate level for comprehension by grade nine students?
-Concerns:
    Do you have any concerns about the content?

Are any of the screens potentially offensive?

The following criteria were provided for use in judging each characteristic:

-**Acceptable**:
In terms of the specified characteristics, the screen and its' content are acceptable.

-**Revise**:
In terms of the specified characteristics, the screen and its' content are acceptable with some revision.

-**Reject**:
In terms of the specified characteristics, the screen and its' content are unacceptable.

If they were satisfied that a screen and its' content was acceptable in terms of a specified characteristic, no entry was required on the checklist for that screen. If they judged that a screen and its' content needed revision, they were asked to indicate this by placing a check (√) in the appropriate place in the checklist **and** by indicating their suggestion for revision on the sheet below the screen in question. If they judged that a screen and its' content were unacceptable, they were asked to place a check (√) in the appropriate place in the checklist **and** indicate their reason for rejection on the sheet below the screen in question. If they judged that a screen and its' content were acceptable but had concerns, they were asked to place a check (√) in the column "Concerns" **and** indicate their concern on the sheet below the screen in question.

The evaluators did not reject any screens. Although the test item on the disadvantages of abstinence had been rejected, the corresponding screen was judged acceptable. It should be pointed out that the information presented on the screen included suggestions for other forms of expression of sexual intimacy such as kissing and hugging. Two evaluators suggested that the information regarding the factors playing a role in contraception decision-making be reordered so as to have the factors values and goals listed first and second and the factors effectiveness, safety and information third, fourth and fifth respectively. Another revision included the minimal protection against STD's and AIDS under the performance objectives "disadvantages of oral contraceptives" and "disadvantages of the diaphragm." Incidentally, the evaluators pointed out a few typographical errors which had not been detected previously. Finally, one concern of this investigator was that some illustrations might be perceived as offensive. This particular concern, however, proved to be unfounded.

Pilot Testing the Quiz

A pilot study of the quiz was carried out for a number of reasons. First, an item analysis was conducted to assess and improve the quality of each item of the quiz (Popham, 1990). Second, the pilot study permitted an estimation of how much gain in knowledge was a function of retesting alone. Third, it provided a baseline of data for comparison with the two groups receiving the unit on contraception instruction via the computer and the lecture format. The pilot study consisted of administering the quiz twice with a two week period between each testing session. Educators in school B agreed to have some of their students participate in the pilot study. It was decided that three classes would be selected for the pilot study and two more would be approached later for the experiment. Although the classes were not selected randomly, they were not selected for any specific reasons either since all were equally available.

Educators in school B organized an evening with the parents and invited the investigator to talk about the research project. The pilot study and the experiment were explained and the parents were informed that some of their children would bring home a letter requesting their permission to let their child participate in the study. If the parents agreed, they were requested to sign a consent form and return it to the sexuality education coordinator via their child. The parents were also informed that they could withdraw their child from the study at any point during the pilot study without negative consequences to their child. They were also informed that their child would be requested to sign a consent. Finally, they were informed that confidentiality would be maintained in the following manner. The students would not be requested to sign their names on the tests. Each test would be numbered and these numbers would be written beside each name on an attendance list which would be kept by the grade nine sexuality education coordinator. The investigator would not to see the list and no one in the school would see the completed tests. Unfortunately this information session was attended by only 10 parents.

The following week, on a Thursday, the investigator was accompanied to each of the three classes by the sexuality education coordinator. The students in each class were informed of the nature of the study. They were given an envelope containing a letter to the parents explaining the research as well as two consent forms. The letter instructed the parents to sign one form and keep the other if they agreed to let their child participate in the study. The students were informed that they too, would be requested to sign a form if they agreed to participate in the study and that they could withdraw at any time during the conduct of the pilot study. They were asked to take the envelope to their parents and return it the next morning. Finally, confidentiality was explained in detail. Out of the 91 letters distributed, only 22 were returned and signed by the parents. The reading index of the letter to the parents was at the grade 9 level and the consent form was at the grade 7 level.

The reading index for the agreement form was at the grade 5 level. The letter to parents, the consent form and the agreement form related to the pilot study of the quiz are listed in Appendix F.

The following Tuesday, the 22 students were assembled in the library. At this time, the instructions regarding the study were reviewed and the students were given a form to sign indicating their willingness to participate in the study. All students present signed the form. Although the quiz contained 37 questions, most of them completed the quiz in approximately 10 minutes and all of them completed the quiz in 20 minutes. Two weeks later, these 22 students wrote the test again.

The first 27 questions were multiple choices and each question was given a score of 1 for the right answer and 0 for the wrong answer. For the last ten questions, students were instructed to circle one or more options. Thus, a decision was made to treat each option of the last ten questions as true or false. Consequently, a student who decided not to circle an incorrect option was awarded a score of 1. Similarly, a student who circled a correct option was also awarded a score of 1. Furthermore, a student who failed to circle a correct option was awarded a score of 0. Finally, a student who circled an incorrect option was also awarded a score of 0.

The mean score of the first administration of the quiz was 37.45 and the mean score at second administration was 39.68. A t-test was carried out and the increase was found be statistically non-significant (p=.208). Therefore, students did not learn about contraception from doing the test again. An item analysis was performed on the quiz. Although the quiz was built using a criterion-referenced approach, the item analysis (LERTAP computer program) utilized norm-referenced assumptions (M. Samuel, personal communication, April 28, 1992). An important aspect in determining the reliability and validity of the quiz was the ability of each item to discriminate between students who knew about contraception from those who did not. The point biserial supplied by LERTAP provides an estimate of internal consistency by indicating how close the performance on a test item is related to the total score. A negative or near zero point biserial usually indicates poor discrimination (Crocker & Algina, 1986). In this pilot study, few items discriminated poorly. The students had received no instruction on the content related to the quiz, no item was rejected. Therefore, the Hoyt estimate of reliability of the quiz of 0.72, was considered adequate, and no item was rejected.

Evaluating the CAI Program and Lecture Format

The evaluation of the CAI program and the lecture format on contraceptive knowledge of grade nine students was to take place within the context of sexuality education. Since sexuality education is a component of the health curriculum, it is generally taught towards the end of the academic year, usually in April, May or June. Therefore preparations were made to evaluate the CAI program during these three months.

A letter asking the sexuality education coordinators to provide dates for carrying out the evaluation was included in the CAI program validation package. School A was ready to carry out the evaluation in April while school B, who had participated in the pilot study, scheduled their evaluation in the month of May.

Design

The design for this study was quasi-experimental and utilized the non equivalent control group procedure with pre-test and post-test measures of the dependent variable. A convenience sample was the sampling method employed in this study. The treatment group received the unit of instruction on contraception via the computer, whereas the control group received the same unit of instruction through the conventional lecture format. The independent variable in this study is the instructional method used to provide information. Two methods were compared. The demographic characteristics such as age, gender, school, previous experience with the Macintosh™ computer, information related to contraception in school and outside school and being registered in a French immersion class had not been controlled through random assignment. The investigator, therefore, decided to treat them as independent variables to determine whether they interacted with the method of instruction to affect the dependent variable. The dependent variable was the knowledge level of grade nine students related to contraception as measured by the scores on the quiz.

Population and Sample

The population consisted of grade nine students who were taking a health class from urban secondary schools in the province of Alberta. The students could either be in the regular program or in a French immersion program provided their health class was taught in English. Students had to read and write English at a level appropriate for the grade.

The sample size for each group was determined in order to obtain statistical power. It was necessary to first determine the number of group means to be compared, the test statistic, the level of significance, the effect size for that test and the power. The following four group means were to be compared: 1) The CAI program group at pre-test, 2) the CAI program group at post-test, 3) the lecture format group at pre-test and, 4) the lecture format group at post-test. The F ratio test statistic was selected for the present study. The level of significance was set at 0.05. The medium effect size for the F-test is 0.25 (Cohen, 1988) and the acceptable power for nursing research is 0.80 (Polit & Sherman, 1990). Thus, to obtain statistical power of 0.80, the sample size of each group being compared was set at 45. A total of 198 students were approached in both schools at the beginning of the study. Of these, 157 completed the study with 79 in the lecture format group and 78 in the CAI program group.

The sexuality education coordinator of school A met with the investigator approximately two weeks before the beginning of the evaluation. During that meeting, a timetable for the evaluation was developed. The entire population of grade nine students was to be accessed for a total of 136 students. The sexuality education coordinator suggested that the number of participants would be greater if a letter was mailed directly to all the parents informing them about the study rather than giving a letter to the students to hand in to their parents. Moreover, this individual also suggested using a negative consent approach rather than asking parents to sign a consent form to be returned to the school by mail or via their child. This approach was approved by the school authorities and they also provided addressed and stamped envelopes for the mail out which was carried out by this investigator.

The letter informed the parents about the study and addressed the issues of confidentiality along with the possibility of withdrawing their child from the study without penalty and most importantly, it stated that if they did not agree to let their child participate in the research, to inform the school by letter or by contacting the sexuality education coordinator. Otherwise, the letter stated that it would be understood that the parents were agreeing to let their child participate in the research. The parents of two students refused to let their child participate in the study and a few parents also phoned the sexuality education coordinator for more information about the study.

Rather than randomly selecting and assigning each student to the treatment or control group, classes as a whole were assigned to either one of the two groups. Three classes were assigned to the treatment group, the CAI program and, three other classes were assigned to the control group, the lecture format. One French immersion class was assigned to the treatment group and the other was assigned to the control group.

As for school B, the two classes who did not participate in the pilot study were selected for the evaluation of the CAI program during a meeting with the sexuality education coordinator. A time table was set and the school principal agreed to the "negative consent" approach previously employed with school A. Consequently, a similar letter was sent to the parents of the students registered in the two classes not accessed during the pilot study. The parents of two students in school B were not approached as they had previously refused to let their child participate in the regular course session on human sexuality. No objections were reported from parents who received the letter nor did the school receive any inquiry. A total of 62 letters were sent to parents of students. The classes were assigned randomly to the treatment group and the control group.

Data Collection

The evaluation in school A was scheduled to start the week following the mail out to allow approximately seven days for the parents to receive, read and respond to the letter. The unit of instruction was to be taught after the Easter holiday during the second week after the pretest. Initially, the health teachers were to teach the control groups. They were provided with information about the content presented on the computer so that they could provide a parallel form of instruction in class. The investigator was to be present in the computer laboratory for each class receiving the instruction through the CAI program. Finally, the post-test was to occur exactly seven days after the instruction, that is during the same class period the following week.

Six groups of students at the grade nine level were approached over a period of three days during their health class. At this time, the students were informed about the study as well as about the nature of their participation and the issue of confidentiality. All students were informed that they would know whether they were assigned to the treatment or control group only on the day of the instruction. They subsequently were requested to sign the agreement form and to return one copy to the investigator. They retained the second copy for their own information. All of the students present signed the agreement form. They were then given the quiz as a pre-test. Most students completed the quiz in 10 minutes and all were completed in 25 minutes.

After the pre-test was completed, the sexuality education coordinator informed the investigator that the health teachers felt unprepared to teach the control groups as they had not yet reached the point where they were to present the lesson on contraception. They felt that they would teach the content of the study out of context. In light of this situation, the investigator undertook to teach the classes in the control group.

The class periods each lasted a total of 40 minutes. The first class to receive the instruction was assigned to the treatment group. When these students entered the computer laboratory, they were given a disk which contained the CAI program. They were told to open the CAI program and start the lesson immediately. The CAI program, being a HyperCard™ stack, is not a stand alone application. Therefore, it required the HyperCard™ program. This meant that over 20 students would need to start up HyperCard™ which was on one Macintosh™ computer acting as a server. Because of such an intense demand for one program, the speed of the main computer was slowed down substantially. Consequently, it took at least 10 minutes before the students were able to start the computer lesson on contraception. As the HyperCard™ program was already on line at the beginning of the class, the process was accelerated for some students. All students completed the sections on the four methods of contraception. Only a few of them however, were able to complete the section on decision-making. The survey was to be distributed at post-test.

Students in the second and third classes were assigned to the treatment and control group respectively. As they were scheduled to receive the instruction during the same class period, the investigator helped the students in the computer laboratory start the CAI program while the sexuality education coordinator kept the second group of students waiting in the other classroom. As a result, there were only 20 minutes left to the period when the investigator arrived in the control group class to give the instruction. Despite this time constraint, all of the content included in the CAI program was covered and the investigator was able to maintain an interactive atmosphere throughout the lecture. During this time, the sexuality education coordinator went to supervise the students in the computer laboratory.

The fourth group of students, a French immersion class, was the last group to receive the instruction via the computer. As this particular class period was scheduled following lunch, the investigator was able to startup all the computers in advance. When the students arrived they were simply requested to start the instruction. All students in this group completed the instruction program and also had time to write their comments in the final section of the CAI program.

The fifth class was assigned to the control group. In this instance, the sexuality education coordinator was present and assisted the investigator during the instruction by providing additional information at the end of each section. The information provided by the sexuality education coordinator was beyond the scope of the content being measured by the quiz. Again, the investigator encouraged interaction by questioning the students. This strategy was a means of introducing new information and was also an effective way of assessing the students' understanding of the content being presented.

The second French immersion class comprised the final group of students assigned to the control group. The investigator taught the group of students by himself since the sexuality education coordinator was teaching one of her regular classes. An interactive approach was again utilized to present the content. As in the previous classes, the investigator closely adhered to the content presented in the CAI program.

A second administration of the quiz comprised the post-test phase of the study. The students completed the quiz during the same class period, one week later. In this instance, the computer teacher volunteered to supervise one class while the investigator supervised the second group of students. A total of 55 students from the treatment group and 57 students from the control group completed the evaluation in school A. The difference in the sample at the onset (134 students) and the completion of the study (112 students) was predominantly related to absenteeism, illness and change of school.

In school B, the first class was approached by the investigator and the sexuality education coordinator. The purpose of the study was explained and the confidential and voluntary nature of the students' participation was emphasized. Each student was given two copies of the agreement form. They were then requested to sign one copy and return it and to keep the second copy for their information. All students in this class signed the agreement form. The same procedure was repeated in a second class. In this instance, the investigator and the science teacher approached the group. Three students in this class refused to participate in the study. Both classes were informed that they would know whether they were assigned to the treatment or control group only on the day of the instruction. The students completed the quiz after signing their agreement form. Again, the quiz was completed by all students in 25 minutes.

The instruction was given two weeks later and the sexuality education coordinator was present during both class periods which lasted 50 minutes. Arrangements were made to let the students in the treatment group use the computer laboratory during the first class period of the day. The investigator and the science teacher were able to start up the computers in advance and when the students entered the room, they were simply requested to begin the CAI program. A large majority of students completed the CAI program in 35 minutes and all were completed in 50 minutes.

As in school A, the investigator completed the instruction for the control group. Similarly, a combination of questions and visual clues were utilized to present the information and to stimulate interaction. The investigator also used a hard copy of the screen displays of the CAI which enabled him to closely adhere to the content taught on the computer. The instruction was completed with 5 minutes left in the period and this allowed the investigator to address additional questions from the students. The students in both groups completed the quiz as part of the post-test six days later.

Survey

A survey was distributed to those in the CAI program group at post-test to determine their reactions to learning about contraception via the computer. The survey included nine statements. The students were asked to select the answer that best reflected their opinion. The answers followed a five point Lickert scale format: strongly disagree, disagree, neutral, agree and strongly agree. The Cronbach's alpha coefficient of internal consistency of the survey was 0.76.

Protection of Human Rights

The "negative consent" approach was employed as suggested by the schools' educators. A letter mailed directly to the parents of the students described the purpose and the steps involved in the study. The parents were informed that the students were not to write their name on the quiz, that the investigator would not know the identity of the students and that no one from the school would have access to any of the completed quiz. They were also informed about their right to refuse to let their child participate in the study by phoning or writing to the school.

Moreover, they were informed of their right to withdraw their child at any time during the study without negative consequences. Finally they were informed that their child might gain knowledge about contraception from participating in the study. The letter to the parents was at a grade 10 reading level.

The students were given two copies of an agreement form. It contained the same information as in the letter sent to the parents. The students were informed about the confidential nature of the study, their right to decline participating in the study as well as their right to withdraw at any time from the study without negative consequences. The students expressed their consent to participate by signing and returning one agreement form to the investigator and keeping the other for their own information. The agreement form was at a grade 4 reading level. The letter to the parents and the agreement form are presented in Appendix G.

Data Analysis

The data analysis consisted of the following procedures:

1. Item analysis to confirm the quality of the quiz;
2. Descriptive statistics on the data obtained from the quiz;
3. Descriptive statistics and internal consistency coefficient related to the survey questions and;
4. Repeated measures analyses of variance (ANOVA) to determine the significance and sources of differences in contraceptive knowledge of the grade nine students.

The LERTAP program was employed to conduct the item analysis. This program created two files where one consisted of a list of scores and the other provided statistics such as, the total score of each student, group mean, standard deviation, and the Hoyt estimate of reliability, a coefficient of internal consistency. In addition, the point biserial, an index of item discrimination, was given for each item (Nelson, 1974).Using the score file produced by LERTAP, the statistical software

$SPSS^x$ was employed to produce descriptive statistics related to the quiz. Descriptive statistics regarding the survey as well as an index of reliability, the Cronbach's alpha coefficient of internal consistency were also obtained using $SPSS^x$ (SPSS, 1988). Finally, the computation of the repeated measures ANOVAs was also done with $SPSS^x$.

CHAPTER 4: RESULTS

This chapter is divided into four sections. The results from the item analysis related to the quiz are described in the first section. Next, descriptive statistics are provided on the subjects participating in the evaluation study. In the third section, results of the repeated measures analyses of variance are presented. Finally, the reactions of the students to the CAI program are summarized in the fourth section.

Item analysis of the Quiz

An item analysis of the quiz was conducted for each group during the pre-test and the post-test phases of the study. Each of the first 27 multiple choice questions received a score of 1 for the right answer and 0 for the wrong answers. Then, a decision was made to treat the last ten questions of the quiz as true or false options. Consequently, the total number of items analyzed was 87. An important aspect in determining the reliability of the quiz is the ability of each item to discriminate between students who know about contraception from those who do not. The point biserial provides an estimate of internal consistency by indicating how close the performance on a test item in relation to the total score. A negative or near zero point biserial usually indicates poor discrimination (Crocker & Algina, 1986).

The items numbered 11, 12, 13, 15, 16, 17, 30, 31, 46, 54, 68, 84 and 87 had a point biserial of less than 0.10 or negative at pre-test for the lecture format group. The Hoyt estimate of reliability for the total quiz at pre-test for this group was 0.80. The item analysis at post-test for the same group revealed that the items numbered 5, 12, 15, 22, 50, 54, 61, 64, 75, 81 and 84 had a point biserial of less than 0.10 or negative. The Hoyt estimate of reliability of the quiz at post-test for the lecture format group was 0.89. As for the CAI program group, the items numbered 17, 46 and 84 had a point biserial of 0.06, 0.08 and 0.05 respectively at pre-test. The Hoyt estimate of reliability of the quiz was of 0.92 for this group. The items numbered 17, 18, 31, 45, 54, 68, 72, 79 and 84 had a point biserial lower than 0.10 or negative for the same group at post-test. Finally, the Hoyt estimate of reliability of the quiz at post-test for the CAI program group was 0.92.

Regarding item 84, the possibility that a diaphragm leaks or burst is real. Yet, the item was keyed negatively. Thus, it should be keyed positively before future administration of the quiz. The administration of the test with a larger sample is required before revising or rejecting Item 17 and the other items which poorly discriminated.

Descriptive Statistics of the Subjects Participating in the Evaluation Study.

A total of 157 students completed the pre-test, learned the contraception lesson and completed the post-test. The difference in the sample at the onset (196) and the completion of the study (157) was predominantly due to absenteeism and illness. Seventy-nine students were in the lecture format group and 78 were in the CAI program group. There were 75 male students with 38 of these assigned to the CAI program group and 37 to the lecture format group. A total of 82 female students participated in the study. Forty women were assigned to the CAI program group while 42 were in the lecture format group. Very few students were under 14 years of age or over 15. Thus, the demographic data for age was divided in two groups: 1) 14 years of age and under and, 2) 15 years of age and over. There were 78 students in the 14 or under age group and 79 students age 15 or over age group.

One hundred and twelve students participated from school A and 45 students participated from school B. In school A, a French immersion program was in place at the grade nine level. A total of 29 students registered in the French immersion program were included because they received their health instruction classes in English. Of these 29 students, 13 were assigned to the lecture format group whereas 16 were included in the CAI program group. Only 9 of the students indicated that they had never used a Macintosh™ computer. Table 3 provides a summary of the descriptive statistics for the participants in this investigation.

Table 3 Descriptive Statistics of Participants

		Sample Size		
Demographics		Lecture	CAI Program	Total
Undifferentiated		79	78	157
Age:	14 and under	35	43	78
	15 and over	44	35	79
Gender	Male	37	38	75
	Female	42	40	82
School	A	57	55	112
	B	22	23	45
Mac Use	Yes	73	75	148
	No	6	3	9
Birth control information in school	Yes	20	36	56
	No	59	42	101
Birth control information outside school	Yes	46	41	87
	No	33	37	70
French Immersion	Yes	13	16	29
	No	66	62	128

The students were asked to answer "yes" or "no" to the following question:

"Have you received information related to the grade nine lesson on contraception in school?" Fifty-six students (35.7%) answered "yes" while 101 students (64.3%) answered negatively. They were also asked whether they had received information related to the grade nine lesson on contraception outside of school. Eighty-seven students (55.4%) answered positively while 70 (44.6%) students answered negatively. The three way ANOVA showed no interaction between birth control information received prior to the instruction and scores on the quiz.

The maximum score that a student could achieve on the quiz was 87. The mean score of the students in the lecture group on the pre-test quiz was 53.76, with a standard deviation of 8.8, the lowest score being 32 and the highest score being 71. The mean score of the students in the CAI program group at pre-test was 51.64, with a standard deviation of 13.21, the lowest score being 0 and the highest score being 71. A t-test computed to compare both groups at pre-test was non significant, thus suggesting that the two groups were equivalent at pre-test. At post-test, the mean of the students in the lecture group was 66.33 with a standard deviation of 10.29, the lowest score being 39 and the highest score being 81. The mean score for the students in the CAI program group was 65.14 at post-test with a standard deviation of 11.78. The lowest score of the CAI program group at post-test was 34, whereas the highest score was 82. Again, a t-test revealed no significant difference between the two groups at post-test.

Repeated Measures Analyses of Variance

The third research objective presented in the Introduction chapter was as follows: to assess the effect of the CAI program and the lecture format on contraceptive knowledge of grade nine students and determine if there is a difference in knowledge gain when the lesson on contraception is taught through the lecture format as compared with the CAI program. The data collected as part of this third objective was analyzed through repeated measures ANOVAs. Four questions were answered with the repeated measures approach.

1. Are there significant differences in scores over time (between pre-test and post-test)?
2. Do the two groups have significantly different scores after the instruction?
3. Are there any interaction between the instruction type and time?
4. Are there any interaction between demographic data, instruction type and time?

Figure 6 suggests that the scores were significantly greater after receiving the instruction. Indeed, the mean score for the students in the lecture format group increased from 53.76 at pre-test to 66.33 at post-test. Similarly, the mean score for the CAI program group increased from 51.64 to 65.14. The F-test for time is 153 ($p \le 0.001$), confirming that scores at post-test were significantly higher for each group after the instruction. This result suggests that contraception instruction does increase contraceptive knowledge in grade nine students.

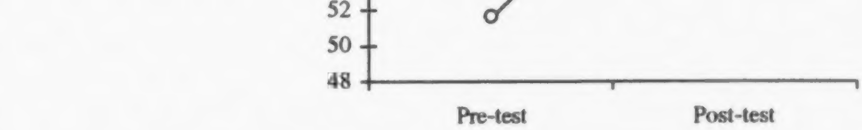


Figure 6: Mean Scores of Lecture Format and CAI Program Groups.

The F-test for differences between methods of instruction is 1.33 (p = .25), indicating that the difference in scores between the two groups is not significant. This result suggests that both methods are equally effective in increasing contraceptive knowledge of grade nine students. The F-test for Instruction by Time is .19 (p = 0.66). Thus, there is no evidence of interaction between instruction and time which parallels the non-significant difference between the lecture format and the CAI program. Table 4 summarizes this repeated measures ANOVA.

Table 4 Summary Table for Repeated Measures: Instruction by Time

Source of Variation	SS	df	MS	F	p
Between subjects					
Instruction	214.56	1	214.26	1.33	.25
Within Groups (error)	24923.84	155	160.8		
Within subjects					
Time	13337.1	1	13337.1	153.00	≤0.001
Instruction X Time	16.99	1	16.99	.19	.66
Time X Within Groups (error)	13511.43	155	87.17		

The fourth question of the repeated measures ANOVA, centers on whether there are any interactions between demographic characteristics, instruction type and time. Initially, it was suspected that factors such as age, gender, previous Macintosh™ utilization, acquisition of contraception knowledge inside and outside school and the involvement in a French immersion program could interact with the instruction to influence how students would score on the quiz. Therefore, despite the fact that the evaluation did not reveal any differences between the types of instruction, the demographic data were treated as independent variables and their effect on contraception knowledge was measured in order to detect any tendencies. As the descriptive statistics demonstrate (see table 3), students with these different characteristics were divided relatively equally between the CAI program group and the lecture format group. Two way (2 X 2) and three way (2 X 2 X 2) repeated measures ANOVAs were conducted. The only partial interaction observed occurred between gender, instruction and time. Table 5 summarizes the results of this repeated measures multifactorial ANOVA.

Table 5 Summary Table for Repeated Measures: Instruction by Gender by Time

Source of Variation	SS	df	MS	F	p
Between subjects					
Instruction	227.71	1	227.71	1.50	.22
Gender	1157.02	1	1157.02	7.64	.006
Within Groups (error) Within Groups = Instruction X Gender	23163.12	153	151.39		
Within subjects					
Time	13187.75	1	13187.75	154.40	≤0.001
Instruction X Time	15.01	1	15.01	.18	.68
Gender X Time	285.76	1	285.76	3.35	.07
Instruction X Gender X Time	159.10	1	159.10	1.86	.17
Time X Within Groups (error) Within Groups = Instruction X Gender	13017.41	153	85.08		

The mean score increased from 53.54 at pre-test to 68.56 at post-test for women. In contrast, the mean score for men increased from 51.84 to 62.86. Figure 7 shows the mean scores in both the lecture format and CAI Program groups for men and women. When comparing women across type of instruction, the mean score in the CAI program group increased from 53.25 at pre-test to 70.00 at post-test in contrast to the lecture format group for which the mean score increased from 54.02 to 67.05. The F-test for gender was 7.64 (p = 0.006). The F-test for the interaction between gender and time was 3.35 (p = 0.7). Finally, the F-test for interaction between gender, instruction and time was 1.86 (p = .17). Although not significant, results of this study suggest that women in the CAI program group tended to gain more knowledge than women in the lecture format group and possibly men in both groups.

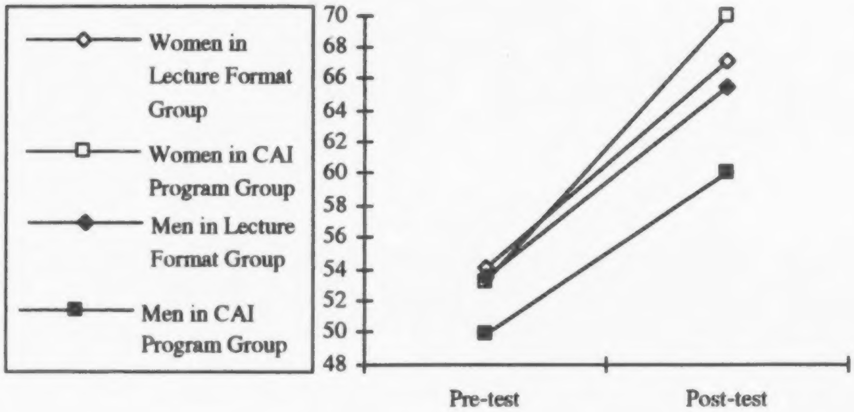


Figure 7: Mean Scores of Lecture Format and CAI Program Groups by Gender.

Reactions of Students to the CAI Program

At the end of the CAI program, the students were requested to write down their comments. This request provided them with an opportunity to express their reactions to the CAI program on contraception as well as write down any questions that they might have. Unfortunately, because of a lack of time, two classes were unable to complete this activity. In the other classes, only a few students commented on the content and the format of instruction program. The comments received varied greatly. A complete list of the students' comments is presented in Appendix H.

Survey Results

Seventy-two of the 78 students in the CAI program group answered the survey. To the statement; "Studying the lesson on the computer made me want to know more about human sexuality," 56 students selected neutral, agree or strongly agree in contrast to 16 who selected disagree or strongly disagree. To the statement; "Learning about birth control on the computer took away the threat of embarrassment," 62 selected neutral, agree or strongly agree while 10 students selected disagree or strongly disagree. Specifically, 33 (42.3%) of the respondents agreed that the CAI program decreased their embarrassment. To the statement; "I feel I have learned a lot of new information from this lesson," 61 students selected neutral, agree or strongly agree whereas 11 selected disagree or strongly disagree. Fifty-one students responded to the question; "I think all lessons on human sexuality should be on computer" by selecting neutral, agree or strongly agree and 19 selected the disagree or strongly disagree options. Sixty-two students selected neutral, agree or strongly agree and 10 selected disagree or strongly disagree in response to the statement; "I would recommend this method of learning about human sexuality to my friends." Sixty-four students selected neutral, agree or strongly agree and 9 selected disagree or strongly disagree in response to the statement; "The lesson clarified some misconceptions I had about birth control." To the statement; "The lesson raised more questions than answers," 46 students selected neutral, agree or strongly agree in contrast to 24 who selected disagree or strongly disagree. To the question; "I had no trouble using the Macintosh™ computer," 62 selected neutral, agree and strongly agree whereas 10 selected disagree or strongly disagree. The final statement was; "I felt I understood what the objectives of the lesson were." This statement resulted in 65 responses for the selected neutral, agree or strongly agree options and 7 responses for the disagree or strongly disagree options.

CHAPTER 5: CONCLUSION, DISCUSSION AND IMPLICATIONS FOR NURSING

The purpose of this study was to develop and evaluate a CAI program for teaching grade nine students about contraception by comparing it to the lecture format. The research question sought to determine if there was a difference in knowledge gain related to contraception between grade nine students who learn about contraception via the computer and those who learn via the lecture format. Three research objectives were elaborated and implemented. First, a CAI program on contraception, based on the Alberta Health and Personal Life Skills Curriculum was developed and validated. Second, an evaluation tool to measure the knowledge level of grade nine students related to contraception was tested and validated. Third, the effect of the CAI program and the lecture format on contraceptive knowledge of grade nine students was assessed and the difference in knowledge gain between the two instructional media was examined.

The third objective represents the focus of the present chapter. The first section will contrast the results of the study with the relevant literature. Then, the limitations of the study will be presented and will be followed by a discussion of the implications of the study for nursing practice. Finally, recommendations for future research will be proposed.

Discussion of Results

The significant increase in the mean scores following contraception instruction suggests that both the computer-assisted instruction method and the conventional lecture method are effective means for raising contraceptive knowledge of grade nine students. Several researchers report similar findings which lend support to the conclusion that computer-assisted instruction may be an effective method for sexuality and contraception education (Alemi, Cherry & Meffert, 1989; DeSonier, 1982; Kann, 1987; Paperny & Starn, 1989).

Interestingly, no significant differences were found in this study between the mean scores of the students in the CAI program group and those in the lecture format group. This finding does not support the results of some investigations which suggest that computer-assisted instruction is more effective than conventional methods of instruction for raising knowledge of adolescents regarding issues of sexuality (Kann, 1987; Paperny & Starn, 1989). Alemi, Cherry & Meffert (1989), however, reported findings similar to those in the present study. Hagler & Knowlton (1987) propose that no significant differences should be expected between different media when all factors other than the medium of instruction are controlled. The present study offers support to this claim as the possible sources of variance (e.g. gender, age) were controlled by being distributed relatively equally between the control group (lecture format) and the experimental group (CAI program).

In addition, the design of this investigation controlled for the material and the instructor effect. In contrast to the present investigation, the study by Paperny & Starn (1989) did not control for the material taught. In this particular instance, the students in the control group attended a nonspecific health class. Consequently, no significant improvement related to the dependent variable of knowledge gain was measured in the control group but a significant improvement was noted for the experimental group. Similarly, in Kann's (1987) study, students in the regular classroom instruction group were taught by their regular instructor rather than the investigator. This lack of control over the instructor effect may explain the absence of a significant improvement in knowledge gain in the group receiving regular classroom instruction.

Although no significant difference was observed between the two instructional methods tested in the present study, an interesting tendency was observed. The women in the CAI program group seemed to learn more about contraception than their counterpart in the lecture format group. Therefore, it is suggested that women may react better to contraception instruction on the computer as opposed to receiving the instruction via the lecture format. Further research is necessary, however, to clarify this question.

In 1981, Jorgensen urged developers of sexuality education programs to conceive solutions that are sensitive to what is embarrassing to students. The concept of computer-assisted instruction provides a non-threatening environment (Billings, 1986) and presents one solution. In the present study, two students reported in the comment section at the end of the CAI program that learning about contraception on the computer decreased their embarrassment. Moreover, (N=72) 43.2% of students who completed the survey stated that the CAI program helped to decrease embarrassment related to learning about contraception. Other investigations also supply evidence which support the notion that the computer medium decreases embarrassment. For example, in the study by Alemi, Cherry & Meffert (1989), high school students indicated feeling more comfortable to discuss sexual matters with their parents after completing the CAI program. In addition, one project at the University of Delaware allowed students to sign on the University computer and ask questions related to sexuality. The anonymity of this service contributed to the success of the project (Hofstetter, 1986).

If embarrassment can be felt by students, it may also be experienced by teachers. A teacher who is uncomfortable in discussing issues related to human sexuality may rush through the subject or even avoid it altogether (Jimenez, July 21, 1991; K. Wendel, personal communication, October 18, 1991). There is also evidence suggesting that poor interpersonal skills in a teacher may counteract the effect of health education (Lohrmann & McClendon, 19[illegible]). In light of the objective nature of the computer, a CAI program can provide standardized instruction. For instance, if the present CAI program, based on the Alberta Education Health and Personal life Skills Curriculum, was utilized in all Alberta schools, all grade nine students attending any school in this province would receive exactly the same information. Moreover, students would not be affected by the interpersonal skills of their instructors. Thus, differences in grade nine students' knowledge of contraception would be due to their differing learning abilities rather than diverse teaching methods. In light of the taboo nature of sexuality and contraception in our society as well as the present context of relative sexual freedom among adolescents, the computer as a medium of instruction, may represent a more appropriate means of teaching adolescents about contraception. At the very least, the computer may play a complementary role to more conventional media of sexuality and contraception instruction.

Limitations of the Study

The most important limitation of this study is that no attempt was made to assess the effect of the CAI program on contraceptive attitude and behavior of grade nine students as the effectiveness of sexuality education programs are often evaluated by means of affective and behavioral criteria. Except for one mention of values, the unit of instruction, on which the CAI program was based, focused exclusively on contraceptive knowledge. A second limitation of this investigation is the number of contraceptive methods presented. Only four contraceptive methods were included in the CAI program. The limited number of methods presented served to keep the average time to complete the lesson to 40 minutes. The contraceptive methods that were excluded were the intra-uterine device, the sponge, the cap, the female condom, female and male sterilization and finally, abortion.

A third limitation is the fact that the performance objectives were not validated prior to the development of the CAI program. Although the group of evaluators indirectly agreed to the performance objectives by accepting each item of the quiz and each screen of the CAI program, the validation of the performance objectives would have strengthen the overall validity of this study.

The generalizability of the findings of this investigation represents a fourth limitation. In this study the investigator controlled for the instructor effect and the material thus creating artificial conditions of instruction. Admittedly, many different teachers are responsible for sexuality and contraception education and this reality will understandably limit the generalizability of findings. The relatively small and homogeneous sample also affect the generalizability of findings. Only two schools and 8 grade nine classes participated in the study. This sample size may not be representative of the Alberta population of grade nine students.

A fifth limitation was pointed out by a student who commented that the information was of little relevance to her since she was of a homosexual orientation.

Unfortunately, it was beyond the scope of the CAI program to address sexual concerns of homosexual and bisexual adolescents. Finally, an important limitation of the CAI program is that it is exclusively compatible with the Macintosh™ computer.

Implications For Nursing Practice

As the responsibility for teaching contraception to secondary school students is gradually being transferred from nurses to teachers, community health and school nurses can offer this CAI program to educators in order to more effectively reach students in health classes. Although teachers currently cover the attitudinal aspects of contraception, many of them may feel uncomfortable in describing how to obtain and use specific contraceptives. Educators could utilize the CAI program for this purpose and consult the school or community health nurse to address any additional questions from the students.

This CAI program could also be utilized in the context of consultative services in a reproductive health clinic or in other health agencies. A computer with the CAI program could be left in the waiting room for individuals or couples to view while waiting for their appointment. Alternatively, it could be integrated in the consultation process.

Recently, some families have begun to teach their adolescents about responsible sexuality by planning a gathering in one home and inviting a health professional to teach about sexuality and contraception. A community health nurse could easily bring the CAI program to these homes and, using a laptop computer, have family members view the program. Finally, in light of the fact that the HyperCard™ software utilized to develop the present CAI program is inexpensive and user friendly, nurses could easily use this software to develop new CAI programs on other health related topics.

Cost-effectiveness

Using the CAI program for providing information on contraception to grade nine students represents a cost-effective alternative to having a nurse teach about contraception to all grade nine classes in each school district. The CAI program could also free up time for the teacher to focus on needs of individual students. Any unresolved question could be addressed by the community health nurse during her or his weekly school visit.

The CAI program could be viewed prior to the classroom discussion of values, since computer-assisted instruction seems to help students feel more comfortable in discussing sexual matters (Alemi, Cherry & Meffert, 1989). Thus, the CAI program may contribute to more effective contraception teaching.

Prior to a visit to the birth control clinic couples could also view the CAI program at home. This may enable the couple to use the time they spend with a nurse more effectively by articulating beforehand questions related to the potential contraceptive of choice.

Recommendations For Future Nursing Research

This study is unique in the sense that it attempted to integrate the curriculum approved by Alberta Education (1986) into a CAI program. As only two Alberta schools participated in the study, more research is necessary to support the present findings. Thus, the first recommendation is to replicate the present study with other Alberta schools. These replication studies could draw their samples from different areas of the province, including rural areas.

A second recommendation is to study the effect of the CAI program in community health agencies such as birth control and reproductive health clinics. The population served by these clinics may be different from the student population in high schools. For instance, drop outs not reached by the school system may very well attend some of these clinics. Furthermore, the design of this study could easily allow for a comparison between clients who receive the information from a nurse and those who receive the instruction via the computer. As in the present study, the quiz could be administered prior to the instruction and on the following visit.

A third recommendation is to repeat the experiment and conduct measurements of sexual embarrassment or guilt. For instance the Sexual Opinion Survey (SOS) could be employed to delineate the students who have sexual guilt (erotophobics) from those who do not (erotophilics). Previous research has suggested that individuals with sexual guilt or embarrassment avoid material related to sexuality (Gerrard, Kurylo & Reis, 1991). Comparing these two groups may shed light on the effectiveness of the CAI program in raising contraceptive knowledge of erotophobic students.

Most of the nursing research published thus far centers on CAI programs for educating students. With the advent of laptop computers, this may be changing as nurses can now envision their practice with computers to assist them in their teaching functions in hospital settings or in the community. Therefore, the time has come for nurses to develop CAI programs targeted at helping the public. In order to achieve this goal, however, more research in this area is necessary to ensure that CAI programs are client centered and user friendly. Consequently, the last recommendation for future nursing research is that nurses develop and evaluate CAI programs for other health related issues. Nurses could develop and evaluate CAI programs to address sensitive issues such as AIDS or other health related issues specific to certain segments of the population. CAI programs tested through research could be used as tools by nurses to reach these groups.

Different types of CAI programs should also be investigated. In the present study, the CAI program that was developed was tutorial in design. Other types of programs that could be considered are drills, simulations, games and tests (Alessi & Trollip, 1991). As nurses grow more comfortable in developing CAI programs, these programs could be tested through evaluative research. Research in this area would enable nurses to identify the most effective type of CAI program.

Summary

At the onset of this research project, support and collaboration from the schools involved in the evaluation of the CAI program was sought. Then, to meet the first research objective, an instructional design was developed followed by the development of a CAI program using HyperCard™ software. An important aspect of instructional design is the development of question items to match each performance objective of the instruction. Thus, as the instructional design was being completed, so was the evaluation tool (quiz). The quiz was then validated by a panel of five experts. Finally, a pilot test of the quiz was conducted in one of the schools involved in the CAI program evaluation.

To address the third research objective, the CAI program was compared to the lecture format using a non-random quasi-experimental design with pre- and post-test measures. The students in both the CAI program and the lecture format scored significantly higher on the quiz at post-test but no difference was found between the two methods. This result supports the conclusion that the CAI program is as effective as the lecture format in increasing contraception knowledge of the grade nine students who participated in this study.

One important implication of this study for nursing practice is that nurses can utilize the computer medium to develop innovative and cost-effective ways of teaching adolescents about contraception. With the advent of laptop computers, nurses can envision themselves using CAI programs to assist them in health education and health promotion activities. To ensure the effectiveness of such programs, however, nurses will need to invest time and energy to develop and evaluate well thought out CAI programs.

REFERENCES

Alberta Education. (1986). *Health and personal life skills: A curriculum guide for junior high schools.* Edmonton, AB: Author.

Alberta Health (1991). *Adolescent reproductive health in Alberta: Selected indicators (Female): 1988-1990.* Edmonton, AB: Author.

Alemi, F., & Cherry, F., & Meffert, G. (1989). Rehearsing decisions may help teenagers; An evaluation of a simulation game. *Computers in Biology and Medicine, 19*(4). 283-290.

Alessi, S. M., & Trollip, S. R. (1991). *Computer Based Instruction: Methods and development.* (2nd ed.). New York: Prentice Hall.

Allgeier, A. R. (1983). Informational barriers to contraception. In D. Byrne, & W. A. Fisher (Eds.). *Adolescents, Sex, and contraception.* Hillsdale, NJ: Lawrence Erlbaum.

Atwater, E. (1988). *Adolescence* (2nd ed.). Englewood Cliffs, NJ: Prentice Hall.

Bangert-Drowns, R. L., Kulik, J. A., & Kulik, C. C. (1985). Effectiveness of computer-based education in secondary schools. *Journal of Computer-Based Instruction, 12,* 59-68.

Billings, D. (1986). *Computer assisted instruction for health care professionals. A handbook for designing, evaluating and using C.A.I. courseware.* Norwalk, CT: Appleton-Century-Croft.

Bonham, G. H., , Nicholson, A., Clark, M., O'Malley, K., Ready, H., & Smith, L. (1987). *In trouble... a way out*. Calgary: Alberta Community Health System.

Brooks-Gunn, J., & Furstenberg, F. F., Jr. (1989). Adolescent sexual behavior. *American Psychologist, 44,* 249-257.

Byer, C. O., Shainberg, L. W., & Jones, K. L. (1988). *Dimensions of human sexuality* (2nd ed.). Dubuque, IA: Wm. C. Brown.

Campbell, J., & Golick, J. (1988). *Sexuality: An education resource book.* Canada: Global/Modern Curriculum Press.

Clarity collective (1983). *Taught not caught: Strategies for sexuality education.* Fitzroy, Australia: Spiral Educational Resources.

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Hillsdale, NJ: Lawrence Erlbaum Associates, Inc.

Committee on Teenage Sexuality (1991). *Teen Sexuality in Edmonton.* Edmonton, AB.: Author.

Crocker, L. M., & Algina, J. (1986). *Introduction to classical and modern test theory.* Orlanda, FL: Holt, Rinehart & Winston.

Dawson, D. A. (1986). The effects of sex education on adolescent behavior. *Family Planning Perspectives, 18*, 162-170.

DeSonier, L.G. (1982). The effects of microcomputer assisted instruction on the contraceptive knowledge, attitudes, and behavior of college students. *Dissertation Abstracts Internationsl, 43,* 399A.

Dick, W., & Carey, L. (1990). *The systematic design of instruction* (3rd ed.). Glenview, ILL: Scott, Forseman.

Elkind, D (1984). Teenage thinking: Implications for health care. *Pediatric Nursing. 10*(6), 383-385.

Fisher, W. A. (1983). Adolescent contraception: summary and recommendations. In D. Byrne, & W. A. Fisher (Eds.), *Adolescents, sex, and contraception.* Hillsdale, NJ: Lawrence Erlbaum Associates.

Fisher, W. A., Byrne, D., & White, L. A. (1983). Emotional barriers to contraception. In D. Byrne, & W. A. Fisher (Eds.), *Adolescents, sex, and contraception.* Hillsdale, NJ: Lawrence Erlbaum Associates.

Gerrard, M., Kurylo, M., & Reis, T. (1991). Self-esteem, erotophobia, and retention of contraceptive and AIDS information in the classroom. *Journal of Applied Social Psychology, 21*, 368-379.

Hagler, P., & Knowlton, J. (1987). Invalid implicit assumption in CBI comparison research. *Journal of Computer-Based Instruction, 14*(3), 84-88.

Herold, E. S. (1984). *Sexual behavior of Canadian young people.* Canada: Fitzhenry & Whiteside.

Hofstetter, F.T. (1986). *The eleventh summative report of the office of computer-based instruction.* Newark, DE: University of Delaware.

Horowitz, E. (1962). Reported embarassment memories of elementary school, high school, and college students. *Journal of Social Psychology, 56*, 317-325.

Jimenez, M. (1991, July 21). *Teacher makes all the difference in sex education.* Edmonton Journal. p. B1.

Jorgensen, S. R. (1981). Sex education and the reduction of adolescent pregnancies: Prospects for the 1980's. *Journal of Early Adolescence, 1*, 38-52.

Kann, L. K. (1987). Effects of computer-assisted instruction on selected interaction skills related to responsible sexuality. *Journal of School Health, 57*(7). 282-287.

King, A. J. C., Beazley, R. P., Warren, W. K., Hankins, C. A., Robertson, A. S., & Radford, J. L. (1988). *Canada youth and AIDS study*. Kingston, ON: Queen's University.

Kirby, D. (1985). Sexuality education: A more realistic view of its effects. *Journal of School Health, 55*(10), 421-424.

Krupa, E. (1990). *An evaluation of a sexuality education program for young teens and their parents.* Unpublished master's thesis. University of Alberta, Edmonton, AB.

Leonard, J. Jr. (1988). Contraceptive knowledge, attitudes and behavior of black adolescent males attending a predominately black university. *Health Education, 19*(3), 22-26.

Lohrmann, D.K., & McClendon, E.J. (1987). A preliminary study of assumptions underlying school health instruction. *Health Education Research, 2*(2), 131-144.

Marsiglio, W., & Mott, F.L. (1986). The impact of sex education on sexual activity, contraceptive use and premarital pregnancy among American teenagers. *Family Planning Persepectives, 18*, 151-162.

Meikle, S., Peitchinis, J. A., & Pearce, K. (1985). *Teenage sexuality.* San Diego, CA: College Hill Press.

Meeks-Mitchell, L., & Heit, P. (1987). *Sexuality: A responsible approach, teacher edition*. Toronto: Merrill.

Nelson, L.R. (1974). *Guide to LERTAP use and interpretation* [Computer program manual]. Dunedin, New Zealand: University of Otago, Education Department.

Orbuch, T. L. (1989). Human sexuality education. In K. McKinney, & S. Sprecher (Eds.), *Human sexuality: The societal and interpersonal context* (pp. 438-462). Norwood, NJ: Ablex.

Paperny, D. M., Starn, J. R. (1989). Adolescent pregnancy prevention by health education computer games: Computer-assisted instruction of knowledge and attitudes. *Pediatrics, 83*(5). 742-752.

Polit, D. F., & Sherman, R. E. (1990). Statistical power in nursing research. *Nursing Research, 39*, 365-369.

Pope, A.J., Westerfield, C., & Walker, J. (1985). The effect of contraceptive knowledge source upon knowledge accuracy and contraceptive behavior. *Health Education, 16*(3), 41-44.

Popham, W. J. (1990) *Modermn educational measurement: a practitioner's perspective* (2nd Ed.). Englewood Cliffs, NJ: Prentice Hall.

Sonenstein, F. L., Pleck, J. H., & Ku, L. C. (1989). Sexual activity, condom use and AIDS awareness among adolescent males. *Family Planning Persepectives, 21*, 152-158.

SPSS Inc. (1988). *SPSS-X user's guide* (3rd ed.). [Computer program manual]. Chicago: Author.

Stout, J. W., & Rivara, F. P. (1989). Schools and sexuality education: does it work? (comments), *Pediatrics, 83*(3), 375-379.

Strouse, J., & Fabes, R. A. (1985). Formal versus informal sources of sexuality education: Competing forces in the sexual socialization of adolescents. *Adolescence, 20*, 251-263.

Taylor, M.E., Wang, M.Q., Jack, L., Jr., & Adame, D.D. (1989). Effects of contraceptive education on adolescent male contraceptive behavior and attitudes. *Health Education, 20*(2), 12-17.

Voydanoff, P., Donelly, B. W. (1990). *Adolescent sexuality and pregnancy.* Newbury Park, CA: Sage.

Wadhera, S., & Silins, J. (1990). Teenage pregnancy in Canada, 1975-1987. *Family Planning Persepectives, 22*, 27-30.

Woodward, J, Carnine, D., & Gersten, R. (1988). Teaching problem solving through computer simulations. *American Educational Research Journal, 25*(1), 72-86.

Zabin, L. S., Hirsch, M. B., Smith, E. A., Streett, R., & Hardy, J. B. (1986). Evaluation of a pregnancy prevention program for urban teenagers. *Family Planning Persepectives, 18*, 119-126.

Zelnik, M., & Shah, F. K. (1983). First intercourse among young americans. *Family Planning Persepectives, 15*, 64-70.

APPENDIX A

Performance Objectives

Instructional Goal

Given abstinence, the pill, condoms and the diaphragm with spermicides, grade nine students will explain how these four birth control methods work, their advantages and disadvantages, their theoretical and user effectiveness, how they can be obtained, the rationale behind the selection of one method over another and the consequences of using and not using one of these four birth control methods.

7. Instructional Objective: Choosing abstinence

Performance Objective

Given a quiz (CN), students will correctly (CR) identify five things to consider when choosing abstinence (B).

Criterion-Referenced Test Item

Circle the letter to the left of each statement that represents an IMPORTANT consideration when choosing a birth control method. One or more statements may be circled.

A) Effectiveness: Will it prevent pregnancy?
B) Safety: Is it a safe method?
C) Values: Is it consistent with my values?
D) Goals: Does it fit with my life goals?
E) Information: Do I know enough about it to make a good decision?

7.1 Define abstinence

Performance Objective

Given a quiz (CN), students will correctly (CR) identify that abstinence means not having sexual intercourse (B).

Criterion-Referenced Test Item

What is abstinence?

A) Withdrawing the penis from the vagina before ejaculation
B) Not having sexual intercourse
C) A rubber coil with string
D) Having sexual intercourse without a birth control method

7.2 Explain how abstinence works

Performance Objective

Given a quiz (CN), students will correctly (CR) identify that abstinence prevents the sperm from entering the vagina (B).

Criterion-Referenced Test Item

Abstinence works by

A) killing sperm and acting as a barrier at the cervix
B) stopping the egg from implanting in the uterus
C) preventing the sperm from entering the vagina
D) predicting when the woman is likely to ovulate

7.3 Describe advantages of abstinence

Performance Objective

Given a quiz (CN), students will correctly (CR) identify at least 4 advantages of abstinence (B).

Criterion-Referenced Test Item

Circle the letter to the left of each statement that represents an ADVANTAGE of abstinence. One or more statements may be circled.

A) May decrease menstrual bleeding
B) No possibility of conflicting values with self and family
C) Can be applied up to 6 hours before intercourse
D) Best method to prevent pregnancy
E) Helps women to know about their body
F) Helps to prevent AIDS and STD's (Sexually Transmitted Diseases)
G) No side effects
H) May be purchased in school washrooms

7.4 State the lowest failure rate of abstinence

Performance Objective

Given a quiz (CN), students will correctly (CR) identify the theoretical effectiveness of abstinence (B).

Criterion-Referenced Test Item

What is the **lowest failure rate** of abstinence?

A) 0
B) 2
C) 4
D) 6

7.5 State the typical failure rate of abstinence

Performance Objective

Given a quiz (CN), students will correctly (CR) identify the user effectiveness of abstinence (B).

Criterion-Referenced Test Item

What is the **typical failure rate** of abstinence?

A) 0
B) 2
C) 4
D) 6

9. Instructional Objective: State the consequences of not using a birth control method

Performance Objective

Given a quiz (CN), students will correctly (CR) identify that the pregnancy rate among sexually active couples not using birth control methods is between 80 and 90% (B).

Criterion-Referenced Test Item

Among sexually active couples not using birth control methods, what is the percentage of women who become pregnant?

A) More than 80
B) 75
C) 50
D) Less than 25

11. Instructional Objective: Choosing the pill as birth control method

Performance Objective

Given a quiz (CN), students will correctly (CR) identify 2 reasons for choosing the pill as method of birth control (B).

Criterion-Referenced Test Item

Circle the letter to the left of each statement that represents an IMPORTANT consideration when choosing a birth control method. One or more statements may be circled.

A) Effectiveness: Will it prevent pregnancy?
B) Safety: Is it a safe method?
C) Values: Is it consistent with my values?
D) Goals: Does it fit with my life goals?
E) Information: Do I know enough about it to make a good decision?

11.1 Identify the hormones contained in the pill

Performance Objective

Given a quiz (CN), students will correctly (CR) identify the best description of the pill (B).

What are the two hormones contained in the pill?

A) Progesterone and cortisone
B) Testosterone and cortisone
C) Progesterone and estrogen
D) Testosterone and estrogen

11.2 Explain how the pill works

Performance Objective

Given a quiz (CN), students will correctly (CR) identify that the pill prevents the egg's release from the ovaries

Criterion-Referenced Test Item

The pill works by preventing

A) an egg's release from the ovaries
B) sperm from entering the uterus
C) sperm from entering the vagina
D) fertilization of the egg by sterilizing sperm

11.3 Describe the advantages of the pill

Performance Objective

Given a quiz (CN), students will correctly (CR) identify at least three advantages of the pill (B).

Criterion-Referenced Test Item

Circle the letter to the left of each statement that represents an ADVANTAGE of the pill. One or more statements may be circled.

A) Decreases menstrual bleeding
B) Regulates menstrual periods
C) Helps to prevent AIDS and STD's (Sexually Transmitted Diseases)
D) Effective immediately
E) Most effective method to prevent pregnancy
F) Reduces risks of certain cancers

11.4 Describe disadvanatages of the pill

Performance Objective

Given a quiz (CN), students will correctly (CR) identify at least 3 disadvantages of the pill

Criterion-Referenced Test Item

Circle the letter to the left of each statement that represents a DISADVANTAGE of the pill. One or more statements may be circled.

A) May cause an inflammation of the uterus or the penis
B) Must be taken each day at the same time
C) Does not help to prevent AIDS and STD's
D) May cause dryness of the skin
E) It is dangerous for women with high blood pressure to take the pill
F) Another birth control method is needed the first month
G) Cannot be taken by women who have never been pregnant
H) May increase the risk of breast cancer

11.5 State the lowest failure rate of the pill

Performance Objective

Given a quiz (CN), students will correctly (CR) identify the theoretical effectiveness of the pill (B).

Criterion-Referenced Test Item

What is the **lowest failure rate** of the pill?

A) less than 1
B) 2
C) 4
D) more than 5

11.6 State the typical failure rate of the pill

Performance Objective

Given a quiz (CN), students will correctly (CR) identify the user effectiveness of the pill (B).

Criterion-Referenced Test Item

What is the **typical failure rate** of the pill?

A) less than 1
B) 2
C) 4
D) more than 5

13. Obtain a prescription for pills

Performance Objective

Given a quiz (CN), students will correctly (CR) identify that a prescription is necessary to obtain pills (B).

Criterion-Referenced Test Item

Circle the letter to the left of each birth control method that needs a prescription. One or more birth control methods can be circled.

A) Abstinence
B) Pill
C) Condoms
D) Diaphragm

12.1 Instructional Objective: Make an appointment with the physician

Performance Objective

Given a quiz (CN), students will correctly (CR) identify that the first step to obtain the pill is to make an appointment to see a physician (B).

Criterion-Referenced Test Item

Some birth control methods need a prescription. What is the first step in getting a prescription?

A) Obtain the prescription from the pharmacist
B) Purchase the prescription from the pharmacist
C) Have a medical examination by the physician
D) Make an appointment to visit the physician

12.2 Instructional Objective: The physician performs a physical examination on the woman

Performance Objective

Given a quiz (CN), students will correctly (CR) identify that the woman generally has a physical examination during the medical appointment (B).

Criterion-Referenced Test Item

Circle the letter to the left of each birth control method that requires a woman to have a physical examination by a physician. One or more birth control methods can be circled.

A) Abstinence
B) Pill
C) Condoms
D) Diaphragm

14. Instructional Objective: Purchase pills at the drug store

Performance Objective

Given a quiz (CN), students will correctly (CR) identify that pills are purchased at a drugstore with a prescription.

Criterion-Referenced Test Item

Where can a prescription be filled?

A) Grocery store
B) Convenience store
C) Restaurant
D) Drugstore

15. Instructional Objective: The woman takes the pill each day

Performance Objective

Given a quiz (CN), students will correctly (CR) identify that the woman takes the pill each day at the same time (B).

Criterion-Referenced Test Item

To be most effective, the pill must be taken

A) each day at the same time
B) the morning after sexual intercourse
C) once a week on the same day
D) the morning before sexual intercourse

15. Instructional Objective: Choosing the diaphragm with spermicides

Performance Objective

Given a quiz (CN), students will correctly (CR) identify 2 reasons for choosing the pill as method of birth control (B).

Criterion-Referenced Test Item

Circle the letter to the left of each statement that represents an IMPORTANT consideration when choosing a birth control method. One or more statements may be circled.

A) Effectiveness: Will it prevent pregnancy?
B) Safety: Is it a safe method?
C) Values: Is it consistent with my values?
D) Goals: Does it fit with my life goals?
E) Information: Do I know enough about it to make a good decision?

15.1 Describe a diaphragm

Performance Objective

Given a quiz (CN), students will correctly (CR) identify that a diaphragm is a soft rubber cup placed in the vagina

Criterion-Referenced Test Item

What is a diaphragm?

A) A thin sheath placed over the erect penis
B) A rubber coil placed inside the uterus
C) A flat round rubber cup placed over the cervix
D) A small sponge covering the cervix

15.2 Identify the nature of spermicides

Performance Objective

Given a quiz (CN), students will correctly (CR) identify that spermicides are solutions that come in creams, foams, jellies, suppositories and tablets that kill sperm (B).

Criterion-Referenced Test Item

Spermicides are creams, foams, jellies, suppositories and tablets that

A) neutralize eggs
B) kill sperm and germs
C) dislodge the fertilized egg
D) acidify the sperm

15.3 Explain how a diaphragm with spermicides works

Performance Objective

Given a quiz (CN), students will correctly (CR) identify that a diaphragm with spermicides acts as a barrier to prevent sperm from entering the vagina in addition to killing sperm.

Criterion-Referenced Test Item

The diaphragm with spermicide works by
A) acting as a barrier that prevents sperm from entering the vagina and by killing sperm
B) acidifying the sperm and making the sperm infertile
C) making the uterus incapable of feeding the fertilized egg
D) increase the vagina's temperature which kills sperm.

15.4 Describe the advantages of the diaphragm with spermicides

Performance Objective

Given a quiz (CN), students will correctly (CR) identify at least three advantages of the diaphragm with spermicides (B).

Criterion-Referenced Test Item

Circle the letter to the left of each statement that represents an ADVANTAGE of the diaphragm with spermicide. One or more statements may be circled.

A) Most effective method to prevent pregnancy
B) Stabilizes body hormones
C) No side effects
D) Can be inserted up to 6 hours before intercourse
E) Helps to protect against AIDS and STD's
F) Effective immediately

15.5 Describe the disadvantages of the diaphragm with spermicides

Performance Objective

Given a quiz (CN), students will correctly (CR) identify at least 2 advantages of the diaphragm with spermicides (B).

Criterion-Referenced Test Item

Circle the letter to the left of each statement that represents a DISADVANTAGE of the diaphragm with spermicide. One or more statements may be circled.

A) Must be fitted properly by a physician or a nurse
B) May leak or burst
C) May be dislodged during sexual intercourse
D) Must be removed immediately after ejaculation
E) Does not help to protect against AIDS and STD's

15.6 State the lowest failure rate of diaphragm with spermicides

Performance Objective

Given a quiz (CN), students will correctly (CR) identify the theoretical effectiveness of diaphragm with spermicides (B).

Criterion-Referenced Test Item

What is the **lowest failure rate** of the diaphragm with spermicide?

A) 2
B) 4
C) 6
D) 8

15.7 State the typical failure rate of diaphragm with spermicides

Performance Objective

Given a quiz (CN), students will correctly (CR) identify the user effectiveness of diaphragm with spermicides (B).

Criterion-Referenced Test Item

What is the **typical failure rate** of the diaphragm with spermicides?

A) 3
B) 8
C) 13
D) 18

17. Obtain a prescription for the diaphragm

Performance Objective

Given a quiz (CN), students will correctly (CR) identify that a prescription is necessary to obtain a diaphragm (B).

Criterion-Referenced Test Item

Circle the letter to the left of each birth control method that needs a prescription.
One or more birth control methods can be circled.

A) Abstinence
B) Pill
C) Condoms
D) Diaphragm

16.1 Instructional Objective: Make an appointment with the physician is necessary

Performance Objective

Given a quiz (CN), students will correctly (CR) identify an appointment with a physician as necessary to obtain a diaphragm with spermicides (B).

Criterion-Referenced Test Item

Some birth control methods need a prescription. What is the first step in getting a prescription?

A) Obtain the prescription from the pharmacist
B) Purchase the prescription from the pharmacist
C) Have a medical examination by the physician
D) Make an appointment to visit the physician

16.2 Instructional Objective: The physician performs a physical examination of the woman

Performance Objective

Given a quiz (CN), students will correctly (CR) identify that the woman generally has a physical examination during the medical appointment (B).

Criterion-Referenced Test Item

Circle the letter to the left of each birth control method that requires a woman to have a physical examination by a physician. One or more birth control methods can be circled.

A) Abstinence
B) Pill
C) Condoms
D) Diaphragm

16.3. Instructional Objective: The physician or the nurse determines the proper size of the diaphragm

Performance Objective

Given a quiz (CN), students will correctly (CR) identify that the physician or the nurse determines the proper size of diaphragm (B).

Criterion-Referenced Test Item

The nurse or the physician must do one important procedure when the diaphragm is chosen as birth control method. What is the procedure?

A) Verify that the diaphragm is waterproof
B) Determine the proper size of the diaphragm
C) Check the diaphragm for any leaks
D) Make sure the diaprhagm fits in the uterus

16.4 Instructional Objective: The nurse or the physician teaches the woman how to fit the diaphragm

Performance Objective

Given a quiz (CN), students will correctly (CR) identify that the nurse or physician teaches the woman how to fit the diaphragm properly in the vagina (B).

Criterion-Referenced Test Item

To ensure that a diaphragm is used correctly, it is necessary for the nurse or physician to

A) warn the woman about hormonal changes that may affect the fit of the diaphragm
B) inform the woman it is expensive
C) teach the woman how to properly fit the diaphragm in the vagina
D) caution the woman about the potential of leak or burst that may occur with a diaphragm

18. Purchase the diaphragm with the prescription

Performance Objective

Given a quiz (CN), students will correctly (CR) identify that the diaphragm is purchased at a drugstore with the prescription.

Criterion-Referenced Test Item

Where can a prescription be filled?
A) Grocery store
B) Convenience store
C) Clothing store
D) Drugstore

18. Use the Diaphragm

18.1 Instructional Objective: The diaphragm is applied and removedwithin safe time limits

Performance Objective

Given a quiz (CN), students will correctly (CR) identify that the diaphragm must be inserted no more than six hours before sexual intercourse and must be removed no later than 6 hours after sexual intercourse (B).

Criterion-Referenced Test Item

To prevent pregnancy, a diaphragm must be inserted and removed

A) no more than 6 hours before sexual intercourse and no later than 24 hours after sexual intercourse
B) any time before sexual intercourse but no later than 12 hours after sexual intercourse
C) immediately before sexual intercourse and immediately after sexual intercourse
D) no more than 6 hours before sexual intercourse and no later than 6 hours after sexual intercourse

18.2 Instructional Objective: Spermicide is properly applied on the diaphragm

Performance Objective

Given a quiz (CN), students will correctly (CR) identify that spermicide is placed in the cup of the diaphragm and is spread around the ring (B).

Criterion-Referenced Test Item

What is the first step in using the diaphragm with spermicide?

A) Check that the diaphragm is waterproof
B) Put vaseline in the cup and spread it around the ring
C) Make sure not to insert the diaphragm inside out
D) Put spermicide in the cup and spread it around the ring

20. Instructional Goal: Choosing Condoms as a Birth Control Method

Performance Objective

Given a quiz (CN), students will correctly (CR) identify 2 reasons for choosing the pill as a method of birth control (B).

Criterion-Referenced Test Item

Circle the letter to the left of each statement that represents an IMPORTANT consideration when choosing a birth control method. One or more statements may be circled.

A) Effectiveness: Will it prevent pregnancy?
B) Safety: Is it a safe method?
C) Values: Is it consistent with my values?
D) Goals: Does it fit with my life goals?
E) Information: Do I know enough about it to make a good decision?

19.1 Describe a condom

Performance Objective

Given a quiz (CN), students will correctly (CR) identify that a condom is a thin sheath that fits over the erect penis (B).

Criterion-Referenced Test Item

What is a condom?

A) A flat round rubber cup placed over the cervix
B) A thin sheath that fits snugly over the erect penis
C) A small piece of plastic with strings inserted in the uterus
D) A small sponge covering the cervix

19.2 Explain how a condom works

Performance Objective

Given a quiz (CN), students will correctly (CR) identify that the condom is a mechanical barrier that prevents the sperm from entering the vagina (B).

Criterion-Referenced Test Item

How does the condom work?

A) It acts as a chemical barrier that kills the sperm
B) It is a device that prevents the egg from implanting in the uterus
C) It acts as a mechanical barrier that prevents the sperm from entering the vagina
D) It is a chemical contraceptive that prevents the egg's release from the ovaries

20.3 Describe the advantages of condoms

Performance Objective

Given a quiz (CN), students will correctly (CR) identify at least four advantages of condoms (B).

Criterion-Referenced Test Item

Circle the letter to the left of each statement that represents an ADVANTAGE of condoms as a birth control method. One or more statements may be circled.

A) Helps to protect against AIDS and STD's
B) Teaches men about their body
C) Readily available
D) Does not interrupt sex
E) No possibility of pregnancy
F) Can be applied up to 6 hours before each intercourse
G) Portable
H) Inexpensive

19.4 Describe disadvantages of condoms

Performance Objective

Given a quiz (CN), students will correctly (CR) identify at least four disadvantages of condoms (B).

Criterion-Referenced Test Item

Circle the letter to the left of each statement that represents a DISADVANTAGE of the condom. One or more statements may be circled.

A) May decrease feeling for the man
B) Does not help to protect against AIDS and STD's
C) The penis with the condom must be removed immediately after ejaculation
D) May leak or burst
E) Requires a prescription
F) Can be inserted up to 6 hours before each intercourse

19.5 State the lowest failure rate of condoms

Performance Objective

Given a quiz (CN), students will correctly (CR) identify the theoretical effectiveness of condoms (B).

Criterion-Referenced Test Item

What is the **lowest failure rate** of condoms?

A) 0
B) 2
C) 4
D) 6

19.6 State the typical failure rate of condoms

Performance Objective

Given [illegible]dents will correctly (CR) identify the user effectiveness of condoms (B).

What is the **typical failure rate** of condoms?

A) 14
B) 12
C) 10
D) 8

21. Instructional Objective: Purchase condoms

Performance Objective

Given a quiz (CN), students will correctly (CR) identify where condoms can be purchased (B).

Criterion-Referenced Test Item

A) Bookstore
B) Convenience store
C) Drugstore
D) Restaurant

21. Instructional Objective: Effectively use condoms

Performance Objective

Given a quiz (CN), students will correctly (CR) identify that there must be 2.5 cm (1/2 inch) empty space at the tip of the condom. (B).

Criterion-Referenced Test Item

To be most effective, the condom must

A) be applied six hours before sexual intercourse
B) have 1.25 cm (1/2 in) of empty space at the tip
C) remain in place at least eigth hours after sexual intercourse
D) be lubricated with oil or vaseline

APPENDIX B

Test Related to the Grade Nine Lesson on Contraception

Instructions

Age: _______	Gender: ☐M ☐F	Class: 9 - _____

Have you used a Macintosh™ computer before? ☐ Yes ☐ No

Have you received information related to the grade nine lesson on contraception **in** school? ☐ Yes ☐ No

Have you received information related to the grade nine lesson on contraception **outside** school? ☐ Yes ☐ No

Are you in a French immersion program? ☐ Yes ☐ No

Part **B** of the test consists of multiple-choice items. Circle one correct or best answer for each item.

Example:

Edmonton is the capital city of:

A) British Columbia
B) Alberta
C) Saskatchewan
D) Manitoba

Part **C** consists of items followed by statements. One or more statements may be circled for each question.

Example:

Edmonton is:

A) the capital city of Alberta
B) an American city
C) the northenmost city in North America with of over 500,000 population
D) south of Calgary
E) the capital city of Manitoba
F) south of Grande Prairie
G) west of Vancouver
H) known as a Prairie Province

Wait for the signal to start completing part B and part C of the test.

Part B

1. What is abstinence?

A) Withdrawing the penis from the vagina before ejaculation
B) Not having sexual intercourse
C) A rubber coil with string
D) Having sexual intercourse without a birth control method

2. What are the two hormones contained in the pill?

A) Progesterone and cortisone
B) Testosterone and cortisone
C) Progesterone and estrogen
D) Testosterone and estrogen

3. What is a condom?

A) A flat round rubber cup placed over the cervix
B) A thin sheath that fits snugly over the erect penis
C) A small piece of plastic with strings inserted in the uterus
D) A small sponge covering the cervix

4. What is a diaphragm?

A) A thin sheath placed over the erect penis
B) A rubber coil placed inside the uterus
C) A flat round rubber cup placed over the cervix
D) A small sponge covering the cervix

5. Spermicides are creams, foams, jellies, suppositories and tablets that

A) neutralize eggs
B) kill sperm and germs
C) dislodge the fertilized egg
D) acidify the sperm

6. Abstinence works by

A) killing sperm and acting as a barrier at the cervix
B) stopping the egg from implanting in the uterus
C) preventing the sperm from entering the vagina
D) predicting when the woman is likely to ovulate

7. The pill works by preventing

A) an egg's release from the ovaries
B) sperm from entering the uterus
C) sperm from entering the vagina
D) fertilization of the egg by sterilizing sperm

8. How does the condom work?

   A) It acts as a chemical barrier that kills the sperm
   B) It is a device that prevents the egg from implanting in the uterus
   C) It acts as a mechanical barrier that prevents the sperm from entering the vagina
   D) It is a chemical contraceptive that prevents the egg's release from the ovaries

9. The diaphragm with spermicide works by

   A) acting as a barrier that prevents sperm from entering the vagina and by killing sperm
   B) acidifying the sperm and making the sperm infertile
   C) making the uterus incapable of feeding the fertilized egg
   D) increase the vagina's temperature which kills sperm.

For questions 10 to 13, read the following statement and then circle one correct or best answer.

Among sexually active couples using the following birth control method **correctly and consistently**, how many women out of 100 will be pregnant after one year (**lowest failure rate**)?

10. Abstinence

    A) 0
    B) 2
    C) 4
    D) 6

11. The Pill

    A) less than 1
    B) 2
    C) 4
    D) more than 5

12. Diaphragm with Spermicide

    A) 2
    B) 4
    C) 6
    D) 8

13. Condoms

    A) 0
    B) 2
    C) 4
    D) 6

For questions 14 to 18, read the following statement and then circle one correct of best answer.

Not all people use birth control methods correctly and consistently. Given that fact, among sexually active couples using the following birth control method, how many women out of 100 will be pregnant after one year (**typical failure rate**)?

14. Abstinence

    A) 0
    B) 2
    C) 4
    D) 6

15. The Pill

    A) less than 1
    B) 2
    C) 4
    D) more than 5

16. Condoms

    A) 14
    B) 12
    C) 10
    D) 8

17. Diaphragm with Spermicides

    A) 3
    B) 8
    C) 13
    D) 18

18. No Contraception

    A) More than 80
    B) 75
    C) 50
    D) Less than 25

19. Some birth control methods do not need a prescription. Where are these birth control methods most likely to be available for purchase?

    A) Bookstore
    B) Convenience store
    C) Drugstore
    D) Restaurant

20. Some birth control methods need a prescription. What is the first step in getting a prescription?

A) Obtain the prescription from the pharmacist
B) Purchase the prescription from the pharmacist
C) Have a medical examination by the physician
D) Make an appointment to visit the physician

21. Where can a prescription be filled?

A) Grocery store
B) Convenience store
C) Restaurant
D) Drugstore

22. To be most effective, the pill must be taken

A) each day at the same time
B) the morning after sexual intercourse
C) once a week on the same day
D) the morning before sexual intercourse

23. The nurse or the physician must do one important procedure when the diaphragm is chosen as birth control method. What is the procedure?

A) Verify that the diaphragm is waterproof
B) Determine the proper size of the diaphragm
C) Check the diaphragm for any leaks
D) Make sure the diaprhagm fits in the uterus

24. To ensure that a diaphragm is used correctly, it is necessary for the nurse or physician to

A) warn the woman about hormonal changes that may affect the fit of the diaphragm
B) inform the woman it is expensive
C) teach the woman how to properly fit the diaphragm in the vagina
D) caution the woman about the potential of leak or burst that may occur with a diaphragm

25. To prevent pregnancy, a diaphragm must be inserted and removed

A) no more than 6 hours before sexual intercourse and no later than 24 hours after sexual intercourse
B) any time before sexual intercourse but no later than 12 hours after sexual intercourse
C) immediately before sexual intercourse and immediately after sexual intercourse
D) no more than 6 hours before sexual intercourse and no later than 6 hours after sexual intercourse

26. What is the first step in using the diaphragm with spermicide?

A) Check that the diaphragm is waterproof
B) Put vaseline in the cup and spread it around the ring
C) Make sure not to insert the diaphragm inside out
D) Put spermicide in the cup and spread it around the ring

27. To be most effective, the condom must

A) be applied six hours before sexual intercourse
B) have 2.5 cm (1/2 in) of empty space at the tip
C) remain in place at least eigth hours after sexual intercourse
D) be lubricated with oil or vaseline

Part C

28. Circle the letter to the left of each statement that represents an IMPORTANT consideration when choosing a birth control method. One or more statements may be circled.

[28] **A)** Effectiveness: Will it prevent pregnancy?
[29] **B)** Safety: Is it a safe method?
[30] **C)** Values: Is it consistent with my values?
[31] **D)** Goals: Does it fit with my life goals?
[32] **E)** Information: Do I know enough about it to make a good decision?

29. Circle the letter to the left of each statement that represents an ADVANTAGE of abstinence. One or more statements may be circled.

[33] A) May decrease menstrual bleeding
[34] **B)** No possibility of conflicting values with self and family
[35] C) Can be applied up to 6 hours before intercourse
[36] **D)** Best method to prevent pregnancy
[37] E) Helps women to know about their body
[38] **F)** Helps to prevent AIDS and STD's (Sexually Transmitted Diseases)
[39] **G)** No side effects
[40] H) May be purchased in school washrooms

30. Circle the letter to the left of each statement that represents an ADVANTAGE of the pill. One or more statements may be circled.

[41] **A)** Decreases menstrual bleeding
[42] **B)** Regulates menstrual periods
[43] C) Helps to prevent AIDS and STD's (Sexually Transmitted Diseases)
[44] D) Effective immediately
[45] E) Most effective method to prevent pregnancy
[46] **F)** Reduces risks of certain cancers

31. Circle the letter to the left of each statement that represents a DISADVANTAGE of the pill. One or more statements may be circled.

[47] A) May cause an inflammation of the uterus or the penis
[48] **B)** Must be taken each day at the same time
[49] **C)** Does not help to prevent AIDS and STD's
[50] D) May cause dryness of the skin
[51] **E)** It is dangerous for women with high blood pressure to take the pill
[52] **F)** Another birth control method is needed the first month
[53] G) Cannot be taken by women who have never been pregnant
[54] H) May increase the risk of breast cancer

32. Circle the letter to the left of each birth control method that needs a prescription. One or more birth control methods can be circled.

[55] A) Abstinence
[56] **B)** Pill
[57] C) Condoms
[58] **D)** Diaphragm

33. Circle the letter to the left of each birth control method that requires a woman to have a physical examination by a physician. One or more birth control methods can be circled.

[59] A) Abstinence
[60] **B)** Pill
[61] C) Condoms
[62] **D)** Diaphragm

34. Circle the letter to the left of each statement that represents an ADVANTAGE of condoms as a birth control method. One or more statements may be circled.

[63] **A)** Helps to protect against AIDS and STD's
[64] B) Teaches men about their body
[65] **C)** Readily available
[66] D) Does not interrupt sex
[67] E) No possibility of pregnancy
[68] F) Can be applied up to 6 hours before each intercourse
[69] **G)** Portable
[70] **H)** Inexpensive

35. Circle the letter to the left of each statement that represents a DISADVANTAGE of the condom. One or more statements may be circled.

[71] **A)** May decrease feeling for the man
[72] B) Does not help to protect against AIDS and STD's
[73] **C)** The penis with the condom must be removed immediately after ejaculation
[74] **D)** May leak or burst
[75] E) Requires a prescription
[76] F) Can be inserted up to 6 hours before each intercourse

36. Circle the letter to the left of each statement that represents an ADVANTAGE of the diaphragm with spermicide. One or more statements may be circled.

[77] A) Most effective method to prevent pregnancy
[78] B) Stabilizes body hormones
[79] C) No side effects
[80] D) Can be inserted up to 6 hours before intercourse
[81] E) Helps to protect against AIDS and STD's
[82] F) Effective immediately

37. Circle the letter to the left of each statement that represents a DISADVANTAGE of the diaphragm with spermicide. One or more statements may be circled.

[83] A) Must be fitted properly by a physician or a nurse
[84] B) May leak or burst
[85] C) May be dislodged during sexual intercourse
[86] D) Must be removed immediately after ejaculation
[87] E) Does not help to protect against AIDS and STD's

APPENDIX C

Survey on the Computer Lesson Related to Contraception

Instructions

Read each question and circle the statement that best represents your opinion.

1. Studying the lesson on the computer made me want to know more about human sexuality.

Strongly Disagree Disagree Neutral Agree Strongly Agree

2. Learning about birth control on the computer took away the threat of embarrassment.

Strongly Disagree Disagree Neutral Agree Strongly Agree

3. I feel I have learned a lot of new information from this lesson.

Strongly Disagree Disagree Neutral Agree Strongly Agree

4. I think all lessons on human sexuality should be on computer.

Strongly Disagree Disagree Neutral Agree Strongly Agree

5. I would recommend this method of learning about human sexuality to my friends.

Strongly Disagree Disagree Neutral Agree Strongly Agree

6. The lesson clarified some misconceptions I had about birth control.

Strongly Disagree Disagree Neutral Agree Strongly Agree

7. The lesson raised more questions than answers.

Strongly Disagree Disagree Neutral Agree Strongly Agree

8. I had no trouble using the Macintosh™ computer.

Strongly Disagree Disagree Neutral Agree Strongly Agree

9. I felt I understood what the objectives of the lesson were.

Strongly Disagree Disagree Neutral Agree Strongly Agree

APPENDIX D

Validation of the test on Contraception for Grade Nine Students

You will find enclosed the material required to perfom a validation of the test on contraception. This material includes:

1. Test:
   The test is intended to measure the knowledge level of grade nine students about contraception before and after receiving the lesson on contraception.
2. Instructional Analysis:
   The instructional analysis contains the goal of the lesson and a performance objective for each test item. The number in the margin corresponds to the numbered item in the test.
3. Survey:
   The survey contains five questions to be answered by the students having received the lesson on contraception via the computer. The survey is intended to measure their reaction to receiving the instruction on contraception via the computer.
4. Checklist for validating the test items:
   This checklist is for recording your judgement about the quality of the test items.
5. Checklist for validating the survey:
   This checklist is for recording your judgement about the quality of the survey.

Please write your name, position, and the name of the school or health unit where you work on both checklists.

Instruction for Validating the Test Items

Make a judgement about the following characteristics for each test item:

-Curricular Validity:
    Does the item measure the objective as presented in the Instructional Analysis?

-Technical Adequacy:
    Is the item free of errors?
    Is the wording of the item appropriate?
    Is the specified keyed responsed (statement with the bold letters) the correct answer?
    Does the item as it is presented provide clues to the keyed responsed of other items?

-Appropriateness of item content and presentation:
    Is the item offensive in any way?

The criteria you will use to judge the characteristics of each test item are the following:

-**Acceptable**:

In terms of the specified characteristics, the item is acceptable as is.

-**Revise**:

In terms of the specified characteristics, the items is acceptable with some revision.

-**Reject**:

In terms of the specified characteristics, the item is unacceptable.

If you are satisfied that an item is acceptable in terms of a specified characteristic, no entry is required on the checklist for that item.

If you judge that an item needs revision, indicate this by placing a check (√) in the appropriate place in the checklist **and** indicate your suggestion for revision on the test beside the item in question.

If your judge that an item is unacceptable, place a check (√) in the appropriate place in the checklist **and** indicate your reason for rejection on the test beside the item in question.

Instruction for Validating the Survey

Determine if each question meets the following three characteristics: meaningfulness, clarity and relevancy.

Please complete and return the evaluation by Tuesday, January 21, 1992. When you have completed the validation of the test and the survey, put both with their validation checklist in the self-addressed enveloped and post it. If you require further information, you can call me at 433.1170 or call my thesis supervisor, Dr. Peggy Anne Field at 492.6248.

Validation Checklist for Test on Contraception

Name: ______________________

Position: ______________________

Name of school or health unit: ______________________

	Curricular validity		Technical adequacy		Appropriateness of item	
	Revise	Reject	Revise	Reject	Revise	Reject
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
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22						
23						
24						
25						
26						
27						
28						
29						
30						
31						
32						
33						
34						
35						
36						
37						
38						

Validation Checklist for Survey on the Computer Lesson Related to Contraception
Name: ____________________
Position: ____________________
Name of school or health unit: ____________________

Instructions

Determine if each question meets the following three characteristics: meaningfulness, clarity and relevancy.

	Meaningfulness		Clarity		Relevancy	
	Revise	Reject	Revise	Reject	Revise	Reject
1						
2						
3						
4						
5						
6						
7						
8						
9						

APPENDIX E

Validation of the CAI Program on Contraception for Grade Nine Students

You will find enclosed the material required to perfom a validation of the CAI program on contraception. This material includes:

1. Hard copies of the CAI program:
   The document is divided in seven section, containing all the content of the CAI program. The sections are:
   - Introduction
   - Menu
   - Abstinence
   - The Pill
   - The Diaphragm
   - The Condom
   - Choosing a Contraception Method
2. A checklist of characteristics to validate at the beginning of each section.
3. Instructional Analysis:
   The instructional analysis contains the goal of the lesson and performance objectives for the CAI program.

Instruction for Validating the CAI program

Make a judgement about the following characteristics for the screens:

-Curricular Congruency:
  Does the information provided on the screen(s) meet the objectives stated in the Instructional Analysis?

-Classroom parallel:
  Does the conent parallel the information on contraception methods presented in the classroom.

-Appropriateness:
  Is the content at an appropriate level for comprehension by grade nine students?

-Concerns:
  Do you have any concerns about the content?
  Are any of the screens potentially offensive?

The criteria you will use to judge the first three characteristics are the following:

- -**Acceptable**: In terms of the specified characteristics, the screen and its' content are acceptable.
- -**Revise**: In terms of the specified characteristics, the screen and its' content are acceptable with some revision.
- -**Reject**: In terms of the specified characteristics, the screen and its' content are unacceptable.

If you are satisfied that a screen and its' content are acceptable in terms of a specified characteristic, no entry is required on the checklist for that screen.

If you judge that a screen and its' content need revision, indicate this by placing a check (√) in the appropriate place in the checklist **and** indicate your suggestion for revision on the sheet below the screen in question.

If you judge that a screen and its' content are unacceptable, place a check (√) in the appropriate place in the checklist **and** indicate your reason for rejection on the sheet below the screen in question.

If you judge that a screen and its' content are acceptable but you have a concern, place a check (√) in the column "Concerns" **and** indicate your concern on the sheet below the screen in question.

Validation Checklist for CAI Program on Contraception

Name: ______________________________

Position: ______________________________

Name of school or health unit: ______________________________

	Curricular congruency		Classroom parallel		Appropriateness		Concerns
	Revise	Reject	Revise	Reject	Revise	Reject	
02							
1.1							
1.2							
1.3							
1.4							
1.5							
1.6							
1.7							
1.9							
1.10							
1.11							
1.12							

	Curricular congruency		Classroom parallel		Appropriateness		Concerns
	Revise	Reject	Revise	Reject	Revise	Reject	
2.1							

	Curricular congruency		Classroom parallel		Appropriateness		Concerns
	Revise	Reject	Revise	Reject	Revise	Reject	
7.1.2							
7.2.3							
7.3.5							
7.3.8							
7.4.4							
7.5.3							
7.5.4							
7.5.5							
7.5.7							
7.5.8							
7.6.4							
7.6.5							
7.6.8							
7.6.9							
7.6.11							
7.7.2							
7.7.3							
7.7.4							
7.7.7							
7.8.3							

	Curricular congruency		Classroom parallel		Appropriateness		Concerns
	Revise	Reject	Revise	Reject	Revise	Reject	
11.1.2							
11.2.2							
11.2.3							
11.3.4							
11.3.8							
11.4.4							
11.4.8							
11.5.1							
11.5.4							
11.6.3							
11.6.4							
12.1.2							
12.1.4							
12.2.3							
12.2.4							
13.1.3							
14.2							

	Curricular congruency		Classroom parallel		Appropriateness		Concerns
	Revise	Reject	Revise	Reject	Revise	Reject	
18.1.2							
18.1.3							
18.2.2							
18.3.3							
18.4.4							
18.5.5							
18.5.6							
18.5.7							
18.5.8							
18.5.9							
18.6.1							
18.7.1							
18.7.4							
19.1.1							
19.1.2							
19.2.3							
19.2.4							
19.3.3							
20							
21.1.1							
21.2							

	Curricular congruency		Classroom parallel		Appropriateness		Concerns
	Revise	Reject	Revise	Reject	Revise	Reject	
15.1.3							
15.2.1							
15.3.5							
15.4.5							
15.4.6							
15.4.7							
15.5.1							
15.5.3							
15.6.3							
15.7.1							
15.7.4							
15.8.3							
16.1.1							
17.1.4							
17.1.5							
17.2							

	Curricular congruency		Classroom parallel		Appropriateness		Concerns
	Revise	Reject	Revise	Reject	Revise	Reject	
3							
4							
Situation							
03 (Abst.)							
Contraception							
01 (None)							
02 (None)							
03 (None)							
What							
07 (Pill)							
10 (Pill)							
07 (Condom)							
08 (Condom)							
07 (Di.)							
08 (Di.)							

APPENDIX F

Letter to the Parents Regarding Quiz on Birth Control Knowledge

Date

Dear parents or guardians,

My name is Luc Therrien. I am a Master's student in Nursing at the University of Alberta. My study consist of developing a computer-based instruction (CBI) to teach grade nine students about birth control. The CBI can provide a private environment for students to learn about birth control without the threat of being embarrassed. If this method of teaching about birth control is found to be effective, this will contribute to the excellence of teaching at the (name of school) School.

The CBI presents information about four topics: abstinence, "the Pill", the condom and the diaphragm with spermicide. The information provided is based on the Health and Personal Life Skills curriculum approved by Alberta Education.

To measure the effectiveness of the CBI on birth control, it is important to determine what the students know before and after the instruction. For this, a quiz was developed. The quiz matches the CBI and therefore, is based on the Health and Personal Life Skills curriculum approved by Alberta Education. In turn, it is important to determine if the quiz measures the birth control knowledge of grade nine students. The first step in achieving this was to have the quiz reviewed by two human sexuality educators from the (name of the school) School. The second step consist of determining the reliability of the quiz. For this, a statistical procedure called "test-retest" is carried out. It means that students answer the quiz once, then wait two weeks and answer the quiz again. There is no instruction in between. If the scores vary widely, it means that the quiz is not fit to measure the birth control knowledge of grade nine students. If there is little or no difference between the two scores, it means that the quiz measures adequately the knowledge of grade nine students about birth control.

If you agree to let your child participate in the study, here is what will happen. After agreeing to the study, your child will answer questions on birth control. Again, two weeks later, you child will answer questions on birth control. The quiz is anonymous and confidentiality will be maintained. Your child will not get marks for this. All information collected will be kept safely and your child's name will not be known to the researcher. You are free to withdraw your child from the study at any time with no negative consequences for him or her in school. If you want to let your child participate in this study, please read the consent form carefully, keep copy 1 for your information, sign and return copy 2 with your child. He/she will give the form to (name of sexuality education coordinator), the teacher responsible for health education.

If you have any question, you can phone my supervisor, Dr. Peggy Anne Field (492.6248) , myself (433.1170) or (name of sexuality education coordinator) at the (name of school) School (school's phone number).

Luc Therrien, BScN, RN

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==================== 2.0 ====================

Summary for Letter to the Parents Regarding Quiz on Birth Control Knowledge

Problems marked/detected: 0/21

Readability Statistics

  Flesch Reading Ease:  60
  Gunning's Fog Index:  12
  Flesch-Kincaid Grade Level: 9

Paragraph Statistics

  Number of paragraphs: 5
  Average length:      5.6 sentences

Sentence Statistics

  Number of sentences:  28
  Average length:      17.1 words
  End with `?`:        0
  End with `!`:        0
  Passive voice:       6
  Short (< 14 words):  10
  Long  (> 30 words):  1

Word Statistics

  Number of words:     479
  Prepositions:        62
  Average length:      4.81 letters
  Syllables per word:  1.53

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Consent Form for Parents of Students

Evaluation of a Questionnaire on Birth Control

Luc Therrien (MN Candidate)
#1411, 8510-111 Street
Edmonton, Alberta, T6G 1H7
Tel: 433-1170

Dr. Peggy Anne Field (Supervisor)
Professor, Faculty of Nursing
University of Alberta
Edmonton, Alberta, T6G 2G3
Tel: 492-6248

This is to certify that I, __________________________, agree to let my child, ________________________ be in the research study of Luc Therrien. Luc is a Master's student in nursing at the University of Alberta. I understand that my child will answer a test on birth control. Two weeks later, my child will again answer a test on birth control. The questions relate to the grade nine lesson on birth control. My child will not get marks for this. All information collected will be kept safely and my child's name will not be known to the researcher. I am free to withdraw my child from the study at any time with no negative consequences for him or her in school. Finally, I understand that this consent form will be destroyed after the study is completed.

Parent or legal guardian of student	Researcher
Name of child: ______________________	
Signature: __________________________	______________________________
Date: ______________________________	

If you have any question, you can phone Luc Therrien or Dr. Peggy Anne Field at the phone numbers listed above.

Copy 1: Please keep

Consent Form for Parents of Students

Evaluation of a Questionnaire on Birth Control

Luc Therrien (MN Candidate)
#1411, 8510-111 Street
Edmonton, Alberta, T6G 1H7
Tel: 433-1170

Dr. Peggy Anne Field (Supervisor)
Professor, Faculty of Nursing
University of Alberta
Edmonton, Alberta, T6G 2G3
Tel: 492-6248

This is to certify that I, ________________________, agree to let my child, ______________________ be in the research study of Luc Therrien. Luc is a Master's student in nursing at the University of Alberta. I understand that my child will answer a test on birth control. Two weeks later, my child will again answer a test on birth control. The questions relate to the grade nine lesson on birth control. My child will not get marks for this. All information collected will be kept safely and my child's name will not be known to the researcher. I am free to withdraw my child from the study at any time with no negative consequences for him or her in school. Finally, I understand that this consent form will be destroyed after the study is completed.

Parent or legal guardian of student	Researcher
Name of child: ______________________	
Signature: ________________________	____________________________
Date: ____________________________	

If you have any question, you can phone Luc Therrien or Dr. Peggy Anne Field at the phone numbers listed above.

Copy 2: Please return

```
================== 2.0 ==================

Summary for Consent Form for Parents of Students

Problems marked/detected: 0/4

Readability Statistics

  Flesch Reading Ease: 74
  Gunning's Fog Index: 10
  Flesch-Kincaid Grade Level: 7

Paragraph Statistics

  Number of paragraphs: 1
  Average length:      9.0 sentences

Sentence Statistics

  Number of sentences: 9
  Average length:      14.5 words
  End with `?`:        0
  End with `!`:        0
  Passive voice:       1
  Short (< 14 words):  5
  Long  (> 30 words):  0

Word Statistics

  Number of words:     131
  Prepositions:        19
  Average length:      4.27 letters
  Syllables per word:  1.39

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Student Agreement Form

Evaluation of a Questionnaire on Birth Control

Luc Therrien (MN Candidate)
#1411, 8510-111 Street
Edmonton, Alberta, T6G 1H7

Dr. Peggy Anne Field (Supervisor)
Professor, Faculty of Nursing
University of Alberta
Edmonton, Alberta, T6G 2G3

I, __________________________ agree to be in the study of Luc Therrien. Luc is a Master's student in nursing at the University of Alberta. I will answer a test on the grade nine lesson on birth control. Two weeks later, I will again answer a test on the grade nine lesson on birth control.

I will not get marks for this. I can refuse to answer any question. I can quit any time I want. I will not be punished for quitting. My name will not be on the tests. The information I give on the tests will be private and will not be seen by my teacher or my parents. Finally, I understand that when the study is over, this agreement form will be destroyed.

	Student	Researcher
Signature:	__________________________	__________________________
Date:	__________________________	

Copy 1: Please keep

Student Agreement Form

Evaluation of a Questionnaire on Birth Control

Luc Therrien (MN Candidate)
#1411, 8510-111 Street
Edmonton, Alberta, T6G 1H7

Dr. Peggy Anne Field (Supervisor)
Professor, Faculty of Nursing
University of Alberta
Edmonton, Alberta, T6G 2G3

I, ________________________ agree to be in the study of Luc Therrien. Luc is a Master's student in nursing at the University of Alberta. I will answer a test on the grade nine lesson on birth control. Two weeks later, I will again answer a test on the grade nine lesson on birth control.

I will not get marks for this. I can refuse to answer any question. I can quit any time I want. I will not be punished for quitting. My name will not be on the tests. The information I give on the tests will be private and will not be seen by my teacher or my parents. Finally, I understand that when the study is over, this agreement form will be destroyed.

	Student	Researcher
Signature:	________________________	________________________
Date:	________________________	

Copy 2: Please return

```
================== 2.0 ==================

Summary for Student Agreement Form

Problems marked/detected: 0/0

Readability Statistics

 Flesch Reading Ease:  84
 Gunning's Fog Index:  7
 Flesch-Kincaid Grade Level: 4

Paragraph Statistics

 Number of paragraphs: 2
 Average length:      5.5 sentences

Sentence Statistics

 Number of sentences: 11
 Average length:      11.2 words
 End with `?`:        0
 End with `!`:        0
 Passive voice:       0
 Short (< 14 words):  8
 Long  (> 30 words):  0

Word Statistics

 Number of words:     124
 Prepositions:        14
 Average length:      3.89 letters
 Syllables per word:  1.32

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APPENDIX G

Letter to Parents Regarding Computer Lesson on Birth Control Knowledge

Date

Dear parents or guardians,

My name is Luc Therrien. I am a Master's student in Nursing at the University of Alberta. My study consists of developing and evaluating a computer-assisted instruction (CAI program) to teach grade nine students about birth control. The CAI program is now developed and the next step is to compare how students learn about birth control on the computer with students learning about birth control through conventional teaching methods. The CAI program can provide a private environment for students to learn about birth control without the threat of being embarrassed. If this method of teaching about birth control is found to be effective, this will contribute to the excellence of teaching at the (name of school) School.

The CAI program presents information about four topics: abstinence, "the Pill", the condom and the diaphragm with spermicide. The information provided is based on the Health and Personal Life Skills curriculum approved by Alberta Education. The CAI program has also met with the approval of two human sexuality educators from the (name of school) School.

If you agree to let your child participate in the study, here is what will happen. After signing a form stating that he or she agrees to participate in the study, your child will answer questions about birth control. Then, your child will either receive the grade nine lesson on birth control in class or at the Macintosh™ computer. The lesson on birth control will contain no information other than what is approved by Alberta Education. The lesson is simply taught in a different way. After the lesson is over, your child will again answer questions about birth control. The quiz is anonymous and confidentiality will be maintained. Your child will not get marks for this. All information collected will be kept safely and your child's name will not be known to the researcher. You are free to withdraw your child from the study at any time with no negative consequences for him or her in school. If you do not agree to let your child participate in the study, phone the school (school's phone number) starting (date) or write to:

(name of school) School
Street Address
City, Province, Postal Code

Otherwise, it will be understood that you consent to let your child participate in the study.

If you have any question, you can phone my supervisor, Dr. Peggy Anne Field (492.6248), myself (433.1170) or (name of sexuality education coordinator) at the (name of school) School (school's phone number).

Luc Therrien, BScN, RN

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Summary for:
Letter to Parents Regarding Computer Lesson on Birth Control Knowledge

Problems marked/detected: 0/16

Readability Statistics

 Flesch Reading Ease:  57
 Gunning's Fog Index:  12
 Flesch-Kincaid Grade Level: 10

Paragraph Statistics

 Number of paragraphs: 5
 Average length:      4.2 sentences

Sentence Statistics

 Number of sentences:  21
 Average length:       17.8 words
 End with `?`:        0
 End with `!`:        0
 Passive voice:        6
 Short (< 14 words):  6
 Long  (> 30 words):  2

Word Statistics

 Number of words:      375
 Prepositions:        56
 Average length:      4.89 letters
 Syllables per word:  1.56

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Student Agreement Form

Evaluation of a computer-assisted instruction on birth control

Luc Therrien (MN Candidate)	Dr. Peggy Anne Field (Supervisor)
#1411, 8510-111 Street	Professor, Faculty of Nursing
Edmonton, Alberta, T6G 1H7	University of Alberta
	Edmonton, Alberta, T6G 2E1

I, ______________________ agree to be in the study of Luc Therrien. Luc is a Master's student in nursing at the University of Alberta. I will answer a quiz on the grade nine lesson on birth control. After the quiz, I will learn the grade nine lesson on birth control either in class or at the Macintosh™ computer.

About a week after the lesson is over, I will again answer a quiz on the grade nine lesson on birth control. I will not get marks for this. I can refuse to answer any question. I can quit any time I want. I will not be punished for quitting. I may gain useful knowledge about birth control.

My name will not be on any quiz. The information I give on each quiz will be private and will not be seen by my teacher or my parents. Finally, I understand that when the research is over, this agreement form will be destroyed.

	Student	Researcher
Signature:	______________________	______________________
Date:	______________________	

Please return one copy and keep the other.

Student Agreement Form

Evaluation of a computer-assisted instruction on birth control

Luc Therrien (MN Candidate) #1411, 8510-111 Street Edmonton, Alberta, T6G 1H7	Dr. Peggy Anne Field (Supervisor) Professor, Faculty of Nursing University of Alberta Edmonton, Alberta, T6G 2E1

I, ______________________ agree to be in the study of Luc Therrien. Luc is a Master's student in nursing at the University of Alberta. I will answer a quiz on the grade nine lesson on birth control. After the quiz, I will learn the grade nine lesson on birth control either in class or at the Macintosh™ computer.

About a week after the lesson is over, I will again answer a quiz on the grade nine lesson on birth control. I will not get marks for this. I can refuse to answer any question. I can quit any time I want. I will not be punished for quitting. I may gain useful knowledge about birth control.

My name will not be on any quiz. The information I give on each quiz will be private and will not be seen by my teacher or my parents. Finally, I understand that when the research is over, this agreement form will be destroyed.

	Student	Researcher
Signature:	______________________	______________________
Date:	______________________	

Please return one copy and keep the other.

```
=================== 2.0 ===================

Summary for Student Agreement Form

Problems marked/detected: 0/0

Readability Statistics

  Flesch Reading Ease:  80
  Gunning's Fog Index:  7
  Flesch-Kincaid Grade Level: 5

Paragraph Statistics

  Number of paragraphs: 3
  Average length:       4.3 sentences

Sentence Statistics

  Number of sentences:  13
  Average length:       12.1 words
  End with `?`:         0
  End with `!`:         0
  Passive voice:        0
  Short (< 14 words):   9
  Long  (> 30 words):   0

Word Statistics

  Number of words:      158
  Prepositions:         21
  Average length:       4.00 letters
  Syllables per word:   1.35


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APPENDIX H

List of Students' Comments Regarding the Contraception CAI Program

Very interesting

It was all very interesting but i will not need the info becausre i'm a lezbian.

This test has taught alot, but it's mostly common sense.

This program is too simple and basic

This was a very intresting program it taught me alot

I felt that i learned several new and important things about sexual intercourse. All of the information given was easy to understand and all will be helpful to remember when the right time comes for me to have sexual intercourse.

This was a very educating program. I think this has informed alot of people about contraception

Yo bucko

I have learned a lot from this program and the lesson was very clear.

Interesting & informative

There is alot of information in this program

I have learned that the safest and most plesurable way to have sex is to use the bongo !!!Iii love those ppictures! E

It wasn't bad

I thought it was very interesting. I learnt a lot. I think that it is a good idea to teach it on the computers because i didn't feel embarassed.

There is no reason why there has to be a picture of "an erected penis", no one realy wants to see that, you can just tell us about it, we can figure it out for ourselves. You shouldn't have to ask us if we plan on having sexual intercourse or not, it's our buisness and all you do when we answer is re-tell us what you just finished saying. It's actualy a good idea to do this on computer, that way anyone who's not mature enough to habdle this won't get embarassed or anything. There should be a section where you can ask questions,ones you don't really want to ask a real person.

I enjoyed the lesson but at the end, it would be great to include some information on the statistics for combined methods for birthcontrol such as condoms and the pill, condoms and diaphram etc. Good luck

You don't need to show obseen picture. It was a educational program for sex for the basic needs.

This program showed me a lot about all the birth control methods and it's better than in class where you can get embarressed

I found this study quite informative and i nteresting . Good luck! And thanks